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INCLUDING

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CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY
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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris, ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta, malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

> “ per litora spargite muscum,
> Naiades, et circùm vitreos considite fontes:
> Pollice virgineo teneros hic carpite flores:
> Floribus et pictum, divæ, replete canistrum.
> At vos, o Nymphæ Craterides, ite sub undas;
> Ite, recurvato variata corallia trunco
> Vellite muscosis e rupibus, et mihi conchas
> Ferte, Deæ pelagi, et pingui conchylia succo.”
> *N. Parthenii Giannettasii*, Ecl. 1.

No. 85. JANUARY 1925.

I.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XLVII. By Prof. M'Intosh, M.D., LL.D., D.Sc., F.R.S., &c.

[Plates I.–VI.]

1. A Contribution to the British Tomopteridæ *.
2. South African and other Tomopterids.
3. On a Post-Larval Terebellid on a Medusa.

1. *A Contribution to the British Tomopteridæ.*

Few more striking forms in the pelagic fauna of the ocean exist than the translucent Tomopteridæ introduced to science by Eschscholtz † from the South Seas and the species considered by him to be a Heteropod mollusk—placing it along with “*Carinaria*, *Pterotrachea*, *Firola*, *Phyllirhoe*, and *Appendicularia*.” In his outline, which resembles that of *T. carpenteri*, he shows twelve pairs of feet which he regarded as respiratory organs. The body is 2⅓ lines long and devoid of a long tail, whilst the frontal

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* I have to thank various zoologists for their kind aid in regard to specimens, viz.: Prof. Gilchrist, Cape Town; Prof. Meek, Newcastle; Dr. Allen, Plymouth; Mr. Southern and Dr. Stelfox, Dublin; and Mr. Elmhirst, Millport. Unfortunately, no opportunity has occurred of examining the living forms since the investigation began, the University Court having closed the Gatty Marine Laboratory to all but myself since my retirement in 1917.

† Oken's 'Isis,' 1825, p. 733, Taf. v. fig. 5.

tentacles, which show a few hairy appendages in front, form a continuous straight line across. The neck passes backward to an ovoid region which evidently is formed by the bases of the second cirri, and the eyes are placed on an inner ovoid region. Posteriorly is a cone with the anus in the centre. He noticed the germ-cells in the feet and body-cavity. Eschscholtz's view has additional interest when the muscular systems of the Gymnosomatous Pteropods is contrasted with that of *Tomopteris*. Huxley subsequently found a species in the same region at Torres Strait. Quoy and Gaimard *, again, in the account of the captures of the corvette 'Astrolabe,' gave it (*Tomopteris*) the title of *Briaræa scolopendra*, likewise assigning it a position, as did also Burmeister, amongst the pelagic Mollusca (Gymnobranchs), and gave a fair representation of it in their plate. They procured their large example (4 inches) off Gibraltar. Ball †, again, found a species, probably *T. catharina*, in Dublin Bay in 1849. Busch ‡, a student of Johannes Müller, next procured what he termed *Tomopteris onisciformis helgolandica*, a small form 2 8 lines long, which he represents in a somewhat stiff figure, giving a brief account of its general structure—such as muscles, alimentary canal, nervous system, and segmental organs, which occur in every segment except the extreme tip of the tail. He thought the eyes were luminous. He figures and describes this form with a first cirrus (his tentacle), which is articulated, but is devoid of a spine. Eighteen feet are present, and he shows a rosette-like organ throughout at the base of the feet. He briefly alludes to transverse muscles of the body-wall under the integument (besides fibres to the tentacles). He thought the food was of an algoid nature. In all probability the form dealt with was *T. kefersteini* or a closely related species, and the use of the specific title *helgolandica* to the common form in the North Sea is therefore misleading. Grube §, who was on a visit to St. Petersburg, found examples in the Museum there, and he described the nervous system, the rosette-like organs, eyes, and other structures, such as the foot-gland which occurred in the lower lobe of the foot (like *T. septentrionalis*). This author first diagnosed it as an Annelid, entering it some years later || after the Serpulids under the Gymnocopa and the family Tomopteridæ. He specially alludes to the rosette-like organ at the base of the feet and the nerve-cords—which he had previously described and figured in Müller's Archiv. He enters a single species, viz., *T. onisciformis*, Eschsch , which he regarded as synonymous with *Briaræa scolopendra*, Quoy & Gaimard. This author placed *Tomopteris* under his second division Gymnocopa, his first being the bristled forms under the Appendiculata Polychæta. Modern authors usually place the

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* Voyage 'Astrolabe,' Zool. t. ii. p. 784, pl. xxi. figs. 21–24.

† Rep. Brit. Assoc. 1849, p. 72.

‡ Muller's Arch. Anat. u. Physiol. 1847, p. 180, Taf. vii. fig. 5.

§ Arch. Anat. u. Physiol. 1848, p. 456, Taf. xvi. figs. 9–16.

|| 'Die Familien der Anneliden,' 1851, pp. 95 & 144.

Tomopteridæ after the pelagic Alciopidæ under the Phyllodocidæ, mainly from their pelagic habits.

In 1853 Sir J. Dalzell * observed a *Tomopteris* about an inch long in water from Newhaven Pier in January and November and also off the Island of May, and he named it *Nereis phasma*, noting, however, that Quoy and Gaimard had found a similar form. His figures show the lamellæ of the feet with frayed tips. His specimens lived in confinement about a week.

Gosse † described as an Annelid a *Tomopteris*, in 1853, under the name of *Johnstonella catharina*, from examples procured at the surface at Ilfracombe on the Devonshire coast, "as transparent and colourless as glass," but later ‡ he considered it identical with *T. scolopendra*, Quoy & Gaimard, and subsequently gave it Eschscholtz's title. His example measured ¾ of an inch. He thought the lamellæ of the feet branchial in function. Leuckart and Pagenstecher §, dealing with examples from Heligoland, viz., *T. onisciformis* and *T. quadricornis* (the latter name has now lapsed), make remarks on the rosette-like organ and give the early stages of the egg.

Dr. Carpenter ||, again, met with *Tomopteris* at Arran in the Clyde, and his figures are interesting and will again be referred to. He alludes to the work of previous observers—Quoy and Gaimard, Huxley (Torres Strait), Eschscholtz, Busch, Grube, Gosse, and Leuckart and Pagenstecher. He was in doubt as to whether the tail was not a zooid, and might be thrown off. He concluded that *Tomopteris* was an Annelid.

Prof. E. P. Wright ¶ procured "*T. onisciformis*" off the South-West coast of Ireland and gave a brief account of its structure, including the presence of cilia in the œsophagus and masses of spermatozoa in the tail, which he did not consider a zooid, as hinted by Dr. Carpenter.

Keferstein ** next described *Tomopteris scolopendrina* from Messina, mentioning specially what he considered ganglia on the ventral nerve-cord and the rosette-like organ.

Carpenter and Claparède ††, in examples from the West Coast of Scotland, note ciliated epaulettes anteriorly, the presence of sperms, a rudimentary ovary in the male, and trichocysts, as well as various larval stages. Moreover, they point out that in young forms a small cirrus (in front of the long spine-bearing one) occurs, and it as well as the second bears a spine, the setigerous region of the first cirrus being separated by a constriction. When the development of the caudal region takes place, the setigerous portion is

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* 'Powers of the Creator,' vol. ii. p. 260, pl. xxxvi. figs. 11, 16, & 17.

† 'A Naturalist's Rambles on the Devonshire Coast,' p. 856, pl. xxv.

‡ Marine Zool. pt. i. p. 106, fig. 181 (1855).

§ Müller's Archiv fur Anat. u. Physiol. 1858.

|| Trans. Linn. Soc. 1860, vol. xxii. p. 353, Tab. lxii.

¶ Rep. Brit. Assoc. 1860, p. 124.

** Müller's Arch. f. Anat. u. Physiol. 1861, p. 360, Taf. ix.

†† Trans. Linn. Soc. vol. xxiii. p. 59, pl. vii.

thrown off and the tubercle remaining gradually disappears. Two ciliated epaulettes occur anteriorly. They did not observe the ventral nerve-cords. In the alimentary canal were several fragments of a *Beroe*, and cilia were present in its caudal region and also in the perivisceral cavity. The segmental organ with its two orifices on the dorsum is described and figured, with the remark that the currents pass inward, so that sperms might enter. Further, that these organs do not occur in the five pairs of appendages which follow the second antenna, so that young forms with only five pairs of pinnules have none. The long-tailed males have eight pairs of ovoid testes with an orifice at the tip and another into the perivisceral cavity. The sperms have two flagella. The ova arise at the base of the segmental tube at the origin of the feet as well as in the caudal prolongation, though they were not certain whether the rudimentary ova in the male developed or not. Their youngest form was $\frac{1}{25}$ in. long and had four pairs of feet, first antenna (cirrus) articulated, and no trace of segmental organs. They mention the presence of thread-cells, but probably these were accidental. In Carpenter and Claparède's paper the authors give the first cirrus "two setæ," a misapprehension readily made from the streaked condition of the tip of the organs—moreover, there is no structural constriction as they describe and figure. The authors give a careful description of the ciliated epaulettes, though in the figure they are somewhat broad. They mention the presence of two (auditory?) vesicles in the cephalic mass as Leuckart and Pagenstecher showed. These have not been seen in the present preparations. They mention cilia in the cœlomic cavity and figure nucleated corpuscles like minute ova. They also show the sperms with elongated heads.

De Quatrefages* in his 'Annéles' constituted the provisional family Tomoptéridiens for the reception of such forms, the head of which somewhat resembled that of mollusks. Behind is a ciliated region, the first pair of tentacles, and a second pair occurs in some species. This author, moreover, laid weight on the occurrence of a spine in the second cirrus as proof of their being connected with the Polychæts. The closely-arranged cylindrical feet bear a pair of lamellæ at their extremity and, as Carpenter shows, the lower lamella bears a kind of flattened cup. The tail carries ovoid appendages with sperms, and appears to be absent in some. The buccal cavity leads into a short exsertile proboscis, a stomach and straight intestine terminating in a sacculated ("d'une sorte de grappe") rectum and anus. There are no blood-vessels, but a rosette-like organ at the end of a ciliated canal at the base of the feet probably indicates a segmental organ. He found in *Tomopteris carpenteri*, from Australia, an opening on each side of the fourth segment surrounded by a cushion-like border—which may be a genital pore. The nervous system consists of a double ganglion bearing the eyes, a buccal ring, and a double ventral cord with traces of ganglia. The general cavity of the body is extensive. The sexes are separate, and the eggs are developed in the perivisceral cavity at the sides of the digestive tube. He alludes to the difficulties attending the discrimination of the species, and, finally, makes two genera—*Eschscholtzia* with four tentacles and *Tomopteris* with two.

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* Tome ii. p. 219, pl. xx. figs. 1 & 2 (1865).

In a critical note by Claparède [*] (1868) he mentions that he procured only once *Tomopteris* at Naples, and that a mutilated example. He objects to De Quatrefages's classification, pointing out that the genus *Eschscholtzia* had been employed for a genus of Ctenophores in the animal kingdom and for a genus of Papaveraceæ in the vegetable kingdom, and, further, that the second pair of tentacles (first cirrus) occurs in the younger stages and is caducous.

Allman [†], off the southern coast of Ireland, found young forms of *Tomopteris*, and he states that the nerve-cords are ribbon-shaped and parallel to each other, passing from the nerve-ring surrounding the pharynx to the tail. They present no ganglionic swellings, but send off filaments to each foot. He mentions that Anton Dohrn had also seen the cords.

Möbius in 1875 considered that the examples he found in the North Sea were identical with Eschscholtz's species.

Lo Bianco [‡] gives the period of maturity in *Tomopteris* at Naples as from October to February, and mentions an example from the depth of 500 metres.

An important contribution to the structure of the group was that of Vejdovsky [§] with good figures, from observations at Prag and Trieste, on examples from the North Sea and the Mediterranean. His researches are chiefly confined to *T. vitrina*, sp. n., a form which presents a first cirrus considerably longer than the frontal tentacles in young forms, shorter than the latter in the young male. In this species well-marked pigment-specks occur in the line of the nerve-cords ventrally. He shows in his figure the cords invested by a neurilemma and their position with regard to the body-wall in section, as well as their relation to the cephalic ganglia and œsophageal ring. The eyes are large and furnished with lenses, lie on the ganglia, and have in front of them a ciliated organ on each side. Besides these eyes he describes and figures an eye in the position of the glandular organ at the base of the web of the foot, furnished with pigment and a lens—in short, a "Flossenauge." He figures two openings, a rosette-like one and a smaller, at the base of the foot, as representatives of the segmental organ, and homologous with the seminal duct and its sac. In the tail of the male he figures oval, whitish, seminal masses in which the male elements are developed, and they are the testes of Carpenter and Claparède.

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[*] Annal. Chætop. Nap. p. 259 (569).

[†] 'Nature,' vol. ix. no. 273, p. 74 (1873).

[‡] Mitt. Zool. St. Neap. Bd. viii. p. 401 (1888).

[§] Zeitsch. f. wiss Zool. Bd. xxxi. p. 81, Taf. vi. & vii. (1878)

E. E. Prince[*] in 1887 from observations at St. Andrews held that the ova of *Tomopteris* arose not as single nucleated cells, but in a compound condition as groups of nucleated cells, one growing at the expense of the rest, and thus the mature ovum is a product of several primary ova. Prof. Prince also made a note on the ciliated organ of the common species.

In his pelagic Annelids from the Canary Islands Greeff[†] devotes a considerable amount of attention to the Tomopteridæ and describes three new species. He first gives a *résumé* of the previous knowledge of the subject from Eschscholtz to Vejdovsky. He considers that Eschscholtz found two pairs of spine-bearing tentacles in his *T. onisciformis* from the South Sea in 1824, viz., the first pair of cirri with the spine enclosed in the tip, and the long spine-bearing or second cirrus behind. He further points out that the first cirrus with the spine at the tip, instead of being a larval organ as Carpenter and Claparède thought, is present in fully mature examples bearing ova as, for instance, in *T. kefersteini*.

In the cephalic ganglion of *T. eschscholtzii* he describes two central ganglionic masses (in section) and a pair of large cells inferiorly. The nervous layer of the bulbus has also large cells, the pigment is brown, and the lens single. Fibrous bands occur on the upper and outer region above the eye on each side. He also alludes to the cephalic ganglia of *T. scolopendra*. With regard to the interpretation of Busch concerning the segmental organ, he is in doubt. He agrees with Keferstein in thinking that there is a slight ganglionic enlargement at each segmental branch; moreover, that the cords communicate by transverse fibres. He discusses the various views concerning the rosette-like organ at great length, but he appears to have seen nothing like a segmental organ as figured by previous investigators. He gives a brief account of the muscular fibres to the feet. His *T. kefersteini* has two anterior tentacles, the second with a spine at the tip (first cirrus), and is 4–5 mm. long, with thirteen to seventeen segments. All the feet have yellow rosette-like organs, and the ovary is near the tip. *T. levipes* is a smaller form, having fifteen to twenty segments and a tail. The eyes have two lenses. The lamellæ of the feet are small, and the rosette-like organ is placed not on the lamella, but on the foot (in the position of the ovary of others), and is reddish brown. *T. eschscholtzii* measures from 13–17 mm. with a variable (short) tail. The head has three tentacles and eyes with a single lens. The ventral lamella of the foot bears the rosette-like organ at the tip of the foot.

Lo Bianco[‡] enters *Tomopteris* in his list of Annelids (without discriminating the species) as having mature ova in numerous feet, and procured from a depth of 500 metres.

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[*] Rep. Brit. Assoc. 1887, p. 769.

[†] Zeitsch. f. wiss. Zool. Bd. xxxii. p. 256, Taf. xv. (1879).

[‡] Mitt. Zool. St. Neap. Bd. viii. p. 405 (1888).

A few remarks on Tomopterids were made in the 'Annals and Magazine of Natural History'[*] for August 1890, when describing the pelagic Annelids of St. Andrews Bay throughout the year.

Chun[†] (1887) describes two species from depths of 500 to 1300 metres. The smaller, *T. elegans*, appears to be identical with *T. kefersteini*, Greeff, and was rarer than *T. euchæta*, Chun, which approaches *T. scolopendra*, Kef., and measured 30 mm. in length.

E. Mayer[‡] (1890) points out that the long second cirrus does not belong to the head-region, but to the region of the mouth, and in the young form it lies behind the mouth and resembles a foot. Further, its nerve-supply comes from the ventral cord, not from the brain.

Apstein[§], in a noteworthy contribution to the subject, observes that the first cirrus is constantly absent in many, but he does not allude to the so-called segmental organ in any of the species procured in the Expedition. *T. helgolandica* he describes as the common form in the North Sea and the Atlantic to the shores of America, his largest example measuring 87 mm. and with twenty-one feet. *T. septentrionalis* extends to the Arctic regions, whilst in the warmer seas *T. kerfersteini* and *T. euchæta* are more common. Most are got at considerable depths, such as *T. kefersteini* at 200-650 metres, *T. septentrionalis* at 800-1000 metres. From the Cape (Agulhas bank) comes *T. eschscholtzii*. This author, apparently following the views of Carpenter and Claparède, thinks that the young forms may be provided with a second frontal tentacle, and he figures what appears to be *T. kefersteini* as such, and further gives a drawing of a young *T. catharina* (Taf. x. fig. 6) having four feet, and a frontal region quite different from that of the adult, and apparently crushed as well as devoid of the frontal tentacle, yet at the bases of the great spinous tentacles rounded bodies (ova or corpuscles) are present, and a cirrus is attached to the first foot. His *T. mariana* has a first cirrus and a longer anterior region behind the second cirri after the manner of *T. kefersteini*, but its frontal tentacles differ. The frontal tentacles are in the position occasionally seen in *T. catharina*, viz., turned forward so as to form a V, and such is of no moment in regard to differentiation. Apstein's figures seem to require revision.

J. H. Fullarton[||], who worked for some time both on the west coast and at the Marine Laboratory, St. Andrews, published an interesting account of the reproductive elements of *Tomopteris*. In the young the sexes, he states, are difficult to discover, but

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[*] Pp. 176, 178, 181, and 182.

[†] "Die pelagische Tierwelt in grösseren Meerestiefen und ihre Beziehung zu der Oberflachenfauna," Bibl. Zool. Cassel, 1887, Heft i.

[‡] "Ueber morphol. Bedeutung borsten tragenden Fuhlercirren von *Tomopteris*," Biol. Centralb. Bd. x. (1890).

Tomopt. der Plankton Exped. Bd. i. A, p. 34, Taf. x. and xi. (1892).

Zoologische Jahrb. Bd. viii. p. 425, Taf. xxvi., xxvii., and xxviii. (1895).

at a later stage both are met with at all seasons of the year, and he thinks the adult females always have ova free in the cœlom during the warm months. He describes the opaque seminal vesicles at the base of the rudimentary feet in the tail as having external and internal openings, and he could not see the segmental organs (with large rosette opening and a smaller one) when the seminal vesicles were present. His seminal vesicles correspond with the testes of Carpenter and Claparède and of Greeff, as well as with the seminal clumps of Vejdovsky. He regards these vesicles as modified nephridia, which in front are seen in the anterior angle, where the foot springs from the body. When the feet become subventral they are not seen. Fullarton alludes to the muscles thus:—"The ventral muscles for each appendage proceed from the ventral muscles of the circular layer of the body-wall in two main bundles. The band arising anteriorly (*ma.*) runs diagonally outwards, and is inserted in the posterior aspect of the lateral appendage of the same segment and crosses its fellow-band, which arises posteriorly, to be inserted on the anterior side of the inner wall of the appendage. The genital orifice is placed in the inner angle formed by the crossing bands, and therefore towards the middle line of the body. The longitudinal muscles of the ventral surface (*ml.*) also cross the genital cleft laterally over its outer border, and medianly also over a part of the orifice itself, acting as a kind of sphincter. While the fibres of the longitudinal muscles maintain a straight course on the outside of the opening, they are curved slightly outwards, and inwards very markedly, as represented in fig. 36. In some with a wide open orifice I have observed what appears to be a plug of mucus filling up that portion which is not covered by the bending fibres of the longitudinal muscular layer." He further mentions that he observed a female which had two openings in the fourth segment, but only one in the fifth. In his figure of the foot the reproductive elements occur in both divisions.

The account of the ventral muscles by Dr. Fullarton is fairly accurate, but it should have been clearly stated that the two pairs of fusiform organs lie outside the muscular layers, and that the slight curves of the two ventral longitudinal muscles could only affect a channel leading to the organs. As Fullarton observes, the organs occur opposite the angle made by the anterior and posterior oblique muscles of the ventral aspect of the foot, but the pointed end and its connecting-band with the opposite side extends considerably beyond the crossing. The space between the curves of the ventral longitudinal muscles thus lies over the central and widest part of the organ, the pointed ends extending on either side. Fullarton alludes to the "ventral muscles of the circular layer of the body-wall," but neither ventrally nor dorsally are there true circular muscles, these being represented only by the oblique bands which cross each other both dorsally and ventrally in their course to each foot, each band supplying the complex fan-like arrangement of the fibres which envelop the organ (foot).

The dorsal longitudinal muscles are similar to the ventral, and stretch from end to end of the body—indeed, these longitudinal fibres occur throughout the circumference of the body, and have the oblique fibres outside them. Fullarton, as above stated, refers only to the fourth and fifth segments (by which he means fourth and fifth feet) as having the sexual openings, whereas in the example alluded to in the following account the two pairs of organs occupied that position, whilst the larger ovoid openings occurred behind them. His somewhat diagrammatic figure (fig. 36), whilst indicating certain features, does not represent either of the organs as seen in the British examples.

In the list of the Annelids of Woods Hole, Massachusetts (1873), Verrill and Smith enter an undetermined species of *Tomopteris*, which Moore subsequently (1903) identified with *T. helgolandica* of Greeff, a species having a wide distribution. Subsequently it is possible that Treadwell found a similar form, though this has not been verified.

An elaborate research on the oocyte of *Tomopteris* was carried out at the Naples Zoological Station by Dr. Wm. Wallace[*], of St. Andrews, especially the changes in the germinal vesicle during the growth of the oocyte. He found no evidence that the chief nucleolus gave origin to the chromosomes of the first maturation-figure. He followed the change in the chromatin of the nucleus from the primitive spireme to the formation of the definitive chromosomes and other features.

Martin Schwartz[†] (1905), a student of Prof. Kükenthal, studied the group at Naples, giving a historical account of the subject and his own researches, chiefly carried out by sections. Judging from his figures there is still need for further work of this kind. He gives an interesting diagram of the movements of the long second cirrus, and outlines of the feet of various species, indicating the extent to which the membranous border or web is attached to the dorsal and ventral divisions. He appends a table as to the absence of a tail, the comparative length of the second cirrus, and the condition of the distal web of the foot. It is interesting in connection with the present observations that he places *T. kefersteini* under those devoid of a tail, and it is with this species that his structural features chiefly deal. He describes the female gonads as in the third to ninth foot, and the genital apertures at the fourth and fifth feet. As to the male aperture he quotes Fullarton, and describes the male organs as club-shaped sacs filled with spermatozoa in the three or four last segments of *T. kefersteini*, and these escape by an opening in front of the base of the foot. In his section of the proboscis there is externally a circular muscular layer, then a radial system of muscular strands with cells, within which is an inner circular muscular layer and then

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[*] Rep. Brit. Assoc. 1903, p. 262.

[†] "Beiträge zu einer Naturgeschichte der Tomopteriden," Jenaische Zeitschrift f. Nat. Bd. xl. N.F. 33, p. 497, Taf. xviii,

a lining of glands. The intestine is lined by tubular glands. The nervous system is typically Annelidan, and the double cord has ganglion-cells at each segment and nerves to the feet. His sections of the frontal tentacles seem to be peculiar—indeed, the minute details of most of the figures need improvement. He found ganglion-cells in the frontal tentacles and circular muscular fibres. Ganglion-cells also were present in the ciliated organs. The second cirri are his taste and balancing organs which also contain nerve-cells. He represents a young form from Heligoland with its anterior end formed of the long first cirri and their enclosed spines, whilst the second cirrus is bifid and much less, and thus it differs much from Apstein's earlier form with the large prostomium, but his figures appear to require re-drawing. He states that *T. kefersteini* was rare at Naples in November, December, and January, and not near the coast—generally in the deeper water of about 150 metres, and seldom at the surface. In February and March it was more common.

In the extensive examination of the pelagic fauna of the Irish Sea by Herdman, Scott, and Johnstone*, *Tomopteris* is stated to occur occasionally throughout April; and then again in August and September to the end of the year. For six months, viz., from January to July, it was not captured. "It is never very abundant, being usually taken in ones or twos, and generally in the deeper nets." The weighted net had fourteen on September 19th and twelve on the 20th. "It seems that this oceanic form occurs comparatively rarely at Plymouth, and elsewhere in the English Channel." "Unfortunately, no numbers are given . . . but the probability is that the species is much more abundant in the Irish Sea than in the English Channel."

An important paper on the Tomopteridæ of the Irish seas was published in 1911 by R. Southern†. He found four species, viz., *T. helgolandica*, *T. nisseni*, Rosa, *T. septentrionalis*, Steenstrup, and *T. cavallii*, Rosa, a success due to the regular work of the Fishery cruiser and the efficient apparatus for searching the deeper water supplied by the Irish Fisheries Department, as well as to the experienced hands of Mr. Southern. In regard to the first species, *T. helgolandica* (= *T. catharina*), it is interesting that the maximum period (October) corresponds exactly with that at St. Andrews. His largest specimens (50 mm.) with sixteen well-developed feet were taken 50–80 miles off the south-west coast, which explains the reason why so few large examples occur in St. Andrews Bay. The second form (*T. nisseni*) is large, measuring 65 mm. with twenty-nine feet and a comparatively short tail. The eyes have two or three clear lenses, and brown pigment. The ciliated epaulettes form conspicuous bands on the shoulders. The second pair of tentacles (first cirrus) are absent in the adult, and the spinous pair are very long. There are no glands on the two anterior feet, but on the fourth the chromophile glands commence on the lower margin of the ventral wing, and are button-shaped with an aperture in the centre. A hyaline gland occurs in each foot at the apex of the wing. The ventral hyaline gland is always found on the third and following feet, but the dorsal gland is usually absent from seven or eight of the anterior feet. The gonads develop only in the dorsal rami, and free ova occur at all seasons. This form was most abundant in November, and, as will subsequently be shown, agrees in general with *T. carpenteri*. *T. septentrionalis* is most abundant outside the 200-fathom line, occurring in larger numbers than any other form. A single, small, apical hyaline gland on the vertical pinna of the first three feet. Chromophile glands also apical, and lying below the hyaline glands occur on the succeeding feet. The eyes are brown. The largest captures were in May, and Southern thinks that the breeding-season is earlier than in *T. helgolandica* (*catharina*). The largest specimens were 13–21 mm., with twenty-one to twenty-four feet. *T. cavallii*, again, is the rarest species, 12–13 mm. in length and with seventeen to twenty pairs of feet. No glands occur on the three anterior feet, but these have yellow pigment on the wings. The other feet have each a single large chromophile gland on the lower edge of the ventral wing. No second tentacle is present. Ova occurred in November. He does not allude to Carpenter's and Claparède's view that the young may possess the first cirrus, whilst the adults do not.

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* Rep. Lancash. Sea-Fisheries Lab. No. xvi. p. 170 (1908).

† Irish Scient. Investig. 1910, no. iii. p. 7, pl. i. figs. 1 & 2.

The same year Gravier[*] made a note on *T. septentrionalis* from a depth of 950 metres during the Second French Antarctic Expedition, the largest being 12 mm. long and having twenty pairs of feet.

Malaquin and Carin[†] (1911) describe the Tomopteridæ found by the Prince of Monaco in the 'Hirondelle' and 'Princess Alice,' viz., *T. euchæta*, *T. apsteini*, *T. helgolandica*, *T. nisseni*, *T. elegans*, *T. septentrionalis*, *T. planktonis*, and *T. ligulata*.

The Japanese forms were dealt with by Akira Izuka[‡] (March 1914). Besides *T. elegans*, *T. septentrionalis*, and *T. apsteini* he describes *T. pacifica*, a new species 15 mm. long, with a maximum breadth of 1·7 mm., twenty segments, and a long tail. Eyes black, first cirrus present and the second three-quarters total length. Nuchal ciliated grooves. First and second feet with rosette-like organs, but without a pigment-speck; third and fourth feet only with pigment-spot near the tip of the dorsal and ventral rami; fifth to seventeenth feet each with a ventral fin-gland in addition to the pigment-speck. Eggs developed in both rami.

Apstein[§] (1916) describes larvæ of *Tomopteris* which came from the Skagerak and were captured in a tow-net. They somewhat

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[*] "Deuxième Expéd. Antarct. Française," Sci. Nat. p. 72.

[†] Bull. de l'Instit. Oceanogr. no. 205, pp. 1–16.

[‡] Journ. Coll. Sc. Imper. Univ. Tokyo, vol. xxxvi. Article iv. p. 10.

[§] Sitzungsberichten d. Gesell. nat. Freunde, Berlin, No. 2 (1916). I am indebted to Dr. H. C. Williamson for a perusal of this paper.

resembled the trochophores of the Polychæts with a large bluntly conical prostomium, a ring of cilia behind the mouth, and two eyes (fig. 1, 0·7 mm.), besides a pigment-speck on each side external to these and slightly anterior. Apstein's figures are somewhat incomplete, but they present no trace of the frontal tentacles, which probably form at a later period out of the large prostomium, whilst a pair of cirri (the first) project behind the ciliated ring and show the enclosed spine and a pigment-spot at the base; then a constriction separates the foregoing region from the next, which bears the second cirri (*Apstein*), which jut backward from a segment with a projection on each side like a foot, and having a pigment-spot near the tip. Two pairs of feet follow, each with a pigment-spot and a yellow rosette-like organ, apparently in the dorsal lobe, and a tuft of cilia at the tip of the ventral lobe. The rosette-like organ is figured as a cell-wall with four contained cells or granular masses resembling an eye. Behind these two feet a simple conical third is shown with only a pigment-speck. The tail is indefinite in all the figures, though there is a tendency to a lateral peak on each side. In his fig. 5 (0·3 mm.) what appears to be a further stage is shown, though only two feet and perhaps a rudimentary third are figured. In this the frontal region is truncated and the eyes rest on two circular masses (ganglia), the first cirri project outward from a stout base, whilst the second cirri are directed forward from a foot-like process. Two pairs of bifid feet follow.

The classification adopted by Apstein (1892) in the Plankton Expedition rested broadly on the presence or absence of the rosette-like organs, the specific characters depending on these and the foot-glands, though the presence or absence of a tail was also taken into account. Those with the rosette-like organ included *T. helgolandica*, *vitrina*, *levipes*, *mariana*, *nationalis*, and *rolasi*. The second group contained those with only foot-glands, and the specific characters rested on the nature of the webs of the foot, the distribution of the glands, and the presence of the first cirrus. In this division he placed *T. kefersteini*, *septentrionalis*, *Eschscholtzii*, *planktonis*, *scolopendra*, and *euchæta*. Apstein thus recorded twelve species.

Rosa*, after two preliminary papers†, published descriptions of no less than eighteen species, besides six of uncertain position, adding by way of a caution the following features in discrimination, viz.: the absence of the tail in many; the rarity of a rosette in the first foot, for it generally begins in the third; the hyaline gland in the first foot is solitary, and may be absent in the second; the chromophile gland is always in the ventral pinna, the hyaline gland in the dorsal. He classifies the Tomopteridæ thus (in brief):—

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* Rosa, Daniele. "Raccolte Plantuonsche," Fatte Dalla R. Nave 'Liguria,' vol. i. Fasc. v. Tomopteridi, p. 247, Tav. xii., Fierenze, 1908.

† Monit. zoolog. Ital. xviii. no. 7 (1906), and Bull. Mus. Torino, vol. xxxiii. no. 588 (1908).

A Genus *Enapteris*—Cephalic ganglia prolonged anteriorly in an unpaired frontal nerve, eyes minute, proboscis weak and short, feet with rectangular pinnæ not passing internally, second cirrus much longer than the body, tail present, no first cirrus with hyaline glands	*E. euchæta.*
B. Genus *Tomopteris*, Esch (str sen.)—Cephalic ganglia ovoid (generally transversely ovoid), no process anteriorly, eyes large, proboscis stout and long, lobes of the feet more or less conical with a border second cirrus long.	
1. Subgenus *Johnstonella*—Rosette present, generally with a tail, first cirrus absent, generally with hyaline glands	*T elegans*, Chun
2. Subgenus *Tomopteris.*- Rosette absent, tail generally absent, first cirrus absent, hyaline glands present	

1 Subgenus *Johnstonella*

A Rosette only in one branch of the foot, with a tail	*Tomopteris (Johnstonella) levipes*
B Rosette on the first and second foot	
a With a tail	
1. With chromophile and hyaline glands and a spine in the ventral pinna	*T (J) duccii.*
2 Only with a chromophile gland, ventral pinna with a spine (except *nationalis*)	*T. (J) aloysii, T (J) dunckeri, T. (J) nationalis*
b. Without a tail, only chromophile glands, no spine on pinna	*T. (J) mariana*
C. Rosette in the ventral division of feet 1 and 2, no spine; with a tail .	*T. (J.) catharina.*
D. Rosette only on the foot, with a tail, without glands or spine	*T (J) vitrina*
c. With a tail.	
1. Chromophile and hyaline glands in the ventral division .	*T. (J) nisseni.*
d. Without a tail.	
1. Chromophile and hyaline glands present	
a. Hyaline glands only in the dorsal division of the third and fourth feet	*T (J.) elegans*
b. Hyaline glands only in the ventral division.	
1. Hyaline and chromophile glands apical	*T. (J.) septentrionalis*
2 Hyaline glands apical, chromophile inferior.	*T (J.) planktonis, T. (J.) ligulata.*
3. Devoid of hyaline glands.	
α. Chromophile glands inferior	*T. (J.) cavallii.*
β. Chromophile glands apical	*T. (J.) eschscholtzi.*

N B.—The condition of the alimentary canal as regards comparative freedom or fixture does not enter into this arrangement.

The six uncertain forms are: *T. onisciformis*, which he thinks may be *T. elegans*, from the Pacific; *T. scolopendra* from Gibraltar; *T. huxleyi*, which has a first cirrus but no tail, from Torres Strait; *T. danæ*, without first cirrus or tail and with small feet, from the Sulu Sea; *T. carpenteri* without the first cirrus, without a tail (?), and with well-marked feet, from the Antarctic Seas; and, lastly, *T. kefersteini* with a rosette-like organ or a hyaline gland in every pinna, dorsal and ventral, and without a tail, from the Canary Islands. In glancing over these the title *T. onisciformis* has been so frequently employed for various forms that the original species of Eschscholtz has been lost sight of and is even now in doubt. *T. carpenteri* from the Antarctic is probably that described by Benham, whilst *T. kefersteini* may be the form so widely distributed round British shores.

The following account will give a general view of the occurrence of *Tomopteris* throughout the year in St. Andrews Bay, the form being chiefly that of *T. catharina*, though *T. kefersteini* is not uncommon in the midst of the swarms of the former in autumn.

January 13th.—Small forms of *Tomopteris catharina* having eleven to twelve feet and measuring about 4 mm., the tail being short, whilst the second cirri are as long as the body. The largest was about 11–12 mm., with fifteen well-developed feet, and a longer tail with five rudimentary feet, besides several minute processes on the sides of the tip. The oblique muscle-fibres of the feet are numerous and fine. None showed traces of the rosette-like organ or tubes, or of ova. On the 24th four occurred, the longest measured about 9 mm. and had twenty feet. The body of the largest was opaque posteriorly (half), but there was no distinct appearance of gonads.

February 19th.—The surface-net procured a single example with twelve feet, along with *Aglantha* and *Sagitta*. The short tail had only a single rudimentary foot on each side. The neck (behind the frontal tentacles) was very short, convex and granular at the sides. A gland was present toward the tip of the ventral division of the feet at the base of the lamellæ. The bottom-net on the same date gave nine examples, with feet ranging from eleven to fourteen. In one a foot had been removed, leaving a conical stump (with an opaque tip) not half the length of its neighbour. The muscular fibres of the feet seem to spread out as fine fans from front and rear, crossing each other and continuing to the distal part of the foot, whilst the longitudinal fibres of the body pass onward at their bases.

On March 2nd only three small examples with eleven to twelve feet were captured.

On March 28th, whilst some were small (eleven to twelve feet), the tails of others were longer, the specimens in the bottom-net being five. One had in its stomach a series of rounded and ovoid bodies like ova, a pale nucleus being visible in some. In one with fourteen well-developed feet, the slender tail had five rudimentary feet. One of 7 mm. on March 30th had thirteen feet and a short tail.

Those captured on May 17th were of medium size and all had considerable tails, one about 17 mm. (in preservation) having eight rudimentary feet on its long tail—moreover, presenting large ova in its feet in front of the tail. There were thirteen feet in front, and the second cirrus was about three-quarters of the total length. Three with shorter tails presented no ova.

On May 28th a single example measuring 18 mm., with eleven anterior feet, seven or eight rudimentary feet on its long tail. It had ova in all but the last two or three feet. The smaller ova occurred at the tip of the foot (ovary) where it joined the lamella.

A long-tailed example on June 4th measured about 24 mm., half belonging to the tail. Ova occurred in the feet and one or two in the base of the second cirrus. The specimen, unfortunately, was too imperfect for minute description, but the tip of the tail formed a rounded sausage-like process without rudimentary feet. Two smaller forms of the same date with shorter tails had no ova. A fine example from the midwater-net of June 11th had sixteen anterior feet, two rudimentary feet on the tail, which also ended in a rounded sausage-like process. No ova were present In the enlarged area at the base of the second cirrus was, on each side of the proboscis, a short process—apparently a ruptured muscular slip (protrusor). The tips of some of the feet (not the lamellæ) presented little granular masses.

On August 10th a damaged example (in fragments) was obtained 15 miles S.S.E. of the Island of May in the midwater-net. So far as could be observed, it was a long-tailed form with remains of ova in the feet. On the 30th of the same month a moderately long-tailed form occurred in the midwater-net in St. Andrews Bay, in which large ova were present in the feet, perivisceral cavity, and the bases of the long second cirrus. Another, with a considerably longer tail, in a similar condition was obtained by the same net on the 31st accompanied by a short-tailed example with thirteen feet, without ova.

On September 12th swarms of examples without tails or with short tails occurred, and none showed reproductive elements. They varied in length from 3 mm. to 9 or 10 mm., yet the smallest had eleven or twelve feet. The tails in all were short, and the second cirri were also comparatively short. These, therefore, pertained to another series. *Tomopteris* was in still larger numbers on the 15th in the bottom-net, though none was large. They ranged from 4 mm. with seven feet to 15 mm. with ten feet and a short tail with two rudimentary feet, the former containing small ova at the tips and a few large ova at the bases of some. In others of only 10 mm. with short tails and closely-arranged rudiments at the sides, and no sausage-like termination, the ova in the feet and cœlom were few. In another of similar length the base of the tail presented two rudimentary feet and a short, terminal, sausage-like portion, the ova were much more numerous, but only a few were moderately large. In a single example, about 17 mm. long, with an elongated tail the ova were more numerous, and four rudimentary processes occurred on the tail. A fine female example, measuring about 35 mm., was procured in the midwater-net on September 20th. The tail was only moderately elongated.

A fine, though softened, example, measuring 39 mm., occurred in the midwater net on October 8th, bearing twelve feet in front of the tail, which was three-quarters the length of the body. The feet, cœlom, and tail were crowded with ova. The wall of the gut in the tail was minutely cellular, each cell being granular, so that a minutely reticulated aspect was caused. Another, somewhat shorter, appeared in the same net on October 16th, with twelve anterior feet and a shorter tail, in which the gut was thrown into wrinkles. Whilst many ova occurred in the feet and the cœlom, none was present in the tail. The chromophile gland was at the tip of the ventral lamella.

On October 17th vast swarms occurred in the bottom-net along with *Sagitta* and young Clupeoids. The majority had more or less elongated tails and few or many ova. The ovigerous forms varied in size from 13-14 mm., with twelve anterior feet and short tails, to larger examples with longer tails. Amongst these were many unripe forms of small size—from 6 mm. upward. In glancing through these swarms, as a rule those with elongated tails carried ova, yet in a few 22-23 mm long and with fifteen feet and a tail no ova were present, but they may have been shed. In the smaller forms with the commencing elongation of the tail, the ova were few and small, yet they would traverse the cœlom to the base of the second cirrus. Size was not a test of maturity, thus some with but ten feet and a short tail with three rudimentary feet had ova, their total length being about 12 mm. Others even less than these had elongated tails and a few ova. In many the proboscis projected as a hoof-shaped process. The commencing elongation of the tail in all indicated the approach of maturity. In softened examples the ova readily passed backward to the tip. In large forms of seventeen feet with a short tail no ova occurred. In one instance the tail of a small form was grasped in the proboscis of a large one and so firmly that rupture of the smaller followed extraction.

The bottom-net on October 24th, 1895, produced still greater swarms, and with similar mixed sizes. One of 16 mm., with sixteen feet and a tail in process of elongation, three or four pairs of opaque white specks, situated segmentally (internally at the bases of the rudimentary feet), which, when magnified, appeared to consist of granules, apparently developing male elements. No ova were present. Various examples were in the same condition. The cells of the terminal portion of the gut are more distinct, perhaps slightly larger than those in front at the proboscis and according to some the proboscis is ciliated. The length of the tail in some females equals that of the body, thus in one 38 mm. long it measured 19 mm. The length of the tail and the large size of the ova in some small examples of a total of 15 mm. is striking. In a second case the tip of the tail had been seized by the proboscis of another and could not be dislodged without rupture. On November 8th only small forms, from 3 mm. and seven feet up to 9 or 10 mm. and eleven feet, were captured. All the breeding forms had disappeared. In some of the larger forms the second cirrus exceeded the length of the body. In December four examples ranging from 5-6 mm. up to 18 mm. were obtained. The great swarms had disappeared, and only a few young forms were left.

So far as can be observed, autumn seems to be the period in

British waters when Tomopterids occur most abundantly, the maximum being in October. This agrees generally with what Mr. Southern found off the West Coast of Ireland.

The type of *Tomopteris* common all round the British shores and extending to the North Sea and the Atlantic is a form which has received many specific names, ranging from *T. onisciformis* to *T. helgolandica*, and which Rosa* terms *T.* (*Johnstonella*) *catharina*, Gosse. It is distinguished (Pl. I. fig. 1) by the slight gap between the frontal tentacles which are of moderate length, the absence of the first cirrus, the presence of a tail, and the occurrence of gonads in both divisions of the feet. In the normal condition the frontal tentacles curve evenly backward (Pl. II. fig. 2) on each side, though occasionally, in preservation, they form a V in front. The eyes are dark brown with a single lens. Externally and rather in front of the eyes on each side is a double ciliated band – the vibratile organ. The protrusor muscles of the proboscis form loops at each side anteriorly. When stretched outward in the normal condition, the spine of the second cirrus lies near the posterior border of the organ, which is bounded mainly by the cuticular investment, whereas the thicker covering in front has a characteristic cellular layer, which commences (as the basal web thins off) as a thicker mass of cells, and gradually assumes the form of a thin layer in front of the spine. The number of feet varies according to the size of the specimen. The lamellæ of the feet are ovato-rotundate with an even margin, and beneath the tip of the ventral division is a large chromophile gland, which seems to become indistinct in preparations in formalin. Brownish pigment occurs in the upper division, in which no hyaline gland could be seen. Ova not only occur in the feet, the cœlom, and the bases of the second cirri, but small ones enter the frontal tentacles. The tail has five or more pairs of rudimentary feet connected by transverse fibres across it. On the whole, the space between the bases of the second cirri and the first foot is somewhat shorter than in *T. kefersteini*.

The foregoing account differs from that given by Rosa, in so far as he describes a deep incision in the middle of the frontal tentacles which is not present in the British representatives. He gives two lenses to the eyes. He states that the vibratile bands are large, linguiform, and converge posteriorly. Moreover, he observes that the first cirrus is generally present, though sometimes, in fact, absent ("generalmente presente matalora effettivamente mancante"). He finds a rosette in the first two feet, and so throughout, and only a chromophile gland in the ventral division. He connects this species with *T. onisciformis*, *T. quadricornis*, *T. helgolandica*, and *Nereis phasma* of various authors, taking Gosse's name by the law of priority.

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* *Op. cit.* p. 288. At first it was thought right to give this form the specific name *helgolandica*, but this title was applied by Busch to a species with a first cirrus, and therefore led to confusion. Gosse's title, therefore, has much in its favour, not to allude to the well-merited compliment to the accomplished wife of Dr. George Johnston.

A specimen with a remarkably long tail (Pl. V. fig. 1) was procured in the bottom-net in St. Andrews Bay on the 24th October, 1895. Its total length was about 38 mm., of which the tail was 19 mm. Moreover, it had projecting from its proboscis the head and first and second cirri of *T. kefersteini*, a much smaller form, the rest of the body of the prey being engulfed in the alimentary canal. The feet, the bases of the second cirri, and the tail to its extremity were crowded with large ova The frontal tentacles curved toward the median line, making a shallow gap which had a papilla in the centre, but the parts had been injured. The soft parts of the second cirrus beyond the shoulder formed a distinct web for a long distance on the slender organ, and the delicate fibre at the tip offered little obstacle to the extreme mobility of the tip No other form yet observed showed these features so distinctly. This elongated web—narrow as it is—must have a considerable effect in the balancing of the animal, though it may not be used in swimming. There are fourteen pairs of feet, the last two being considerably diminished, and the tail has in addition three rudimentary feet, the last very minute. The terminal portion of the tail is smooth, the tip just showing crenations rather than papillæ. The feet have large ovate lamellæ, the ventral presenting a conspicuous chromophile gland somewhat within the tip of the lower fork of the foot and shaped like a peach. The gland has a dimple at its apex inferiorly, and a slight inflection of the lamella externally is visible in some. The glandular tubules are arranged longitudinally and converge to the apex ventrally. The hyaline gland was less easily seen in the preparation. In the first and following feet a rounded granular mass lay beneath the dorsal fork just within its tip, and a similar body above the tip of the ventral division, and such may have been pigmented during life. The last four (diminishing) feet seem to have no chromophile gland and their lamellæ are more elongate. Like the anterior feet these show the same opaque white (in the preparation) on each side of the translucent central streak. This opaque tissue had masses of cells containing refringent granules (Pl. IV. fig. 3) at its border along the central area. The gonads occur in both dorsal and ventral divisions of the feet, and the large ova are everywhere conspicuous, but they do not occur in the lamellæ of the last four feet in front of the tail. No sexual apertures are visible, but at the commencement of the fourth and fifth feet, as first described by Leuckart and Pagenstecher, a transverse opaque white streak is seen at each side over the edge of the intestine, each connected with that of the opposite side by a faint band.

The eyes of this species are stated to be black, but, though they appear very dark by reflected light, they by transmitted light show a brownish tinge.

In examining the structure of the body-wall, an example (female) occurred in which two large ovoid apertures existed in the segment behind the so-called sexual organs, as figured in Pl. IV. fig. 1. They appeared to have been formed by the rupture of the longitudinal muscles of the ventral wall, although the presence of circular fibres round their margins indicated an original purpose. Like the smaller organs they lay in the angle formed by the crossing of the oblique muscles, and connected by a band of tissue in which intercrossing oblique, longitudinal, and other fibres formed a complex. Moreover, an opaque band of fibres was continued from the external border on each side to the dorsum, thus forming a complete ring of circular fibres. The margin of each aperture, besides the circular fibres, presented granules and minute cells amidst the slightly curled ends of the longitudinal fibres, thus making a somewhat opaque ring. The band connecting the two ovoid apertures showed a more definite border posteriorly than anteriorly, but the specimen had been ruptured both in front and rear of this band Oblique bands of fibres crossed at the external curves of each aperture, thus indicating that they occupied a corresponding position to the two pairs of organs in front, but at what stage the apertures make their appearance is still uncertain. In looking over large collections of *Tomopteris* from St. Andrews, those with undeveloped generative elements show no trace of these organs on the fourth and fifth feet, and the tail is, as a rule, short. The elongation of the tail and the development of the ova coincide with the appearance of these structures. It is, however, strange that only one example has been seen with the large ovoid apertures behind these organs, which are conspicuous in hundreds. This condition is analogous to that in the Terebellid *Thelepus*, in which only one adult and fully ripe female with sexual apertures has been observed, and that only off the coast of South Africa.

The two pairs of female organs (Pl. VI. fig. 1) are fusiform in outline with a somewhat ovoid aperture on one side, this aperture showing under pressure a series of minute cells and granules over its area, but whether this is due to its walls or to these occupying its aperture is uncertain. In all probability they fill the aperture which is external to the muscular fibres—longitudinal and oblique. Though some of the longitudinal fibres form a curve on each side as they pass the aperture, in other instances strands of longitudinal fibres, as shown in the figure, cross the aperture in addition. The spindle-shaped body of the organ appears to be cellulo-granular with fibres stretching toward the poles and ending in a filament which proceeds toward the nerve-cord, at which its fibres form a brush, apparently mingling with those from the opposite side. A similar termination seems to occur externally at the base of the foot. At first it was supposed that these became the sexual apertures, but the occurrence of the large paired apertures behind rendered such doubtful.

The alimentary canal commences with a mouth and proboscis (Pl. I. figs. 3 & 4) of the typical character, the latter in spirit-preparations being generally extruded as an oblique process high anteriorly, the fissure sloping to a shorter wall posteriorly.

Powerful muscles (protractor and retractor) effect its movements. The organ thus differs from that of *T. septentrionalis* or *T. nisseni*.

The canal leaving the proboscis, from which it is marked off by a constriction, passes backward to the vent. It has a median dorsal and ventral raphe usually distinguished as an opaque line in each case, and due to longitudinal fibres and a more opaque condition of the cells and granules. The narrow part following the proboscis has strong circular fibres, but these by-and-by cease, and the limiting membrane of the gut is lined by comparatively large gland-cells or areas (Pl. III. fig. 5), so as to give a reticulated aspect to the canal from end to end. These reticulated areas are minutely granular, and appear to form a continuous investment, since they never separate from each other, and rupture of the gut does not affect their adhesion. It is free dorsally, but is fixed at intervals along the ventral median line by short segmental bridles, which are easily torn, so that the delicate canal can be removed in safety—a feature in contrast with the condition in *T. septentrionalis*. No trace has been seen of the cæca alluded to by De Quatrefages and Carpenter in the posterior region of the canal.

The food consists of smaller examples of the same species and of *T. kefersteini*, besides unknown fragments of tissue and ova.

Mr. Southern does not allude to the examples carrying ova, and none of these, which were small, kindly sent by Dr. Stelfox, of the National Museum of Ireland, carried ova on August 27th, 1905. Amongst these, however, were specimens of *T. kefersteini*. These examples, which were examined by Mr. Southern, agree in structure (though the feet were imperfectly preserved) with those from the North Sea.

T. catharina is the common form in the North Sea, and extends to the Mediterranean and the American shores.

Tomopteris kefersteini, Greeff.

1879. *Tomopteris kefersteini*, Greeff, Archiv Acad. Physiol. Bd. xxxii. p. 275, Taf. xviii. figs. 40, 41, 43, 46, 47.
1886. *Tomopteris kefersteini*, Viguier, Archiv Zool. Expér. 2^e sér. tom. iv. p. 412, Tab. xxv. figs. 3–10.
1887. *Tomopteris elegans*, Chun, Bibl. Zool. Cassel, Heft 1, p. 12, Taf. iii. fig. 4.

In this small form a distinct gap separates the frontal tentacles (Pl. I. fig. 1 and Pl. II. fig. 3), but varies in breadth in the several specimens. Indeed, the presence or absence of a gap, and the degree to which it can be deepened or rendered shallow, appears to need further study. Thus, in one of Greeff's figures of the dorsal surface (fig. 40, Taf. xv.), a shallow inflection with a slight papilla in the centre is shown, whereas in fig. 41, from the ventral surface, the gap is much more pronounced, and a large median papilla occupies the centre. Moreover, the ciliated epaulettes are represented as free anteriorly and club-shaped. Two lenses occur in the dark brown pigment of each eye. The body is stated to have no elongated tail, the vent showing (Pl. I. fig. 1) a lateral papilla on each side and a central dimple with two smaller papillæ. The caudal feet are of considerable size, the total number on the body varying from twelve to seventeen. Greeff shows a forked anal region. Such a description accords well with the younger stages of the British examples, though the presence of a tail in the larger examples diverges.

The head in *T. kefersteini* has a series of fine muscular fibres passing forward into the frontal tentacles and diverging on each side to these organs (Pl I fig. 1). Circular fibres also embrace the neck backward to the shoulders. The central region has a continuation of the longitudinal fibres from the front, and these appear to go to the posterior end of the body. Each great second cirrus has the base of the spine ensheathed in granular tissue and muscular fibres, a fan-shaped series passing from the region of the middle constriction of the proboscis forward and outward, part entering the basal region of the long cirrus, the rest spreading on the wall of the body. Across the shoulders fine fibres stretch from side to side, enabling contraction of the region to take place, as well as aiding in the movements of the long cirri. As a transparent object this broad region presents fine fibres decussating all over, so that contraction would readily take place. The projecting bands at each side of the anterior region of the proboscis are probably protractors, and others are retractors

At the base of each foot dorsally (*vide* Pl. IV. fig. 2, which is similar) two fan-shaped series of fibres are conspicuous, not only do they cross the body to the opposite foot but spread out, crossing each other over the foot in a complex manner on to and beyond the bifurcation. These fibres, moreover, in their passage from side to side of the body, cross each other, so that the posterior fibres of the foot on the right become the anterior fibres on the left. Some fibres appear to diverge on the walls of the body, but whether they are lost in the longitudinal strands or curve right over could not be ascertained. In crossing the body some of the fibres seem to cross—in the middle line—those from the anterior border of the foot, joining those of the posterior border of the opposite foot and *vice versa*. This characteristic distribution of the muscular fibres of opposite sides and their union across the body is akin to the arrangement in the epipodia of *Cliopsis* *, one of the deft and powerful swimmers amongst pelagic organisms. In this and its allies in the group of the Gymnosomes the muscular fibres cross each other obliquely in each fin, much after the manner in the foot of *Tomopteris*, and, moreover, pass across the body from one side to the other It is remarkable that in two diverse groups this conspicuous obliquity of the crossed fibres should be found. Such, indeed, in *Tomopteris* would point to greater powers in swimming than have hitherto been attributed to it. The movements of the long cirri are amply provided for, and, in addition, the elasticity of the enclosed spine is a notable asset.

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* *Vide* "Gymnosomes Méditerranéens," par Alice Pruvot-Fol, Arch. Zool. Expér. t. lxii. (1924).

Chun[*] appends to his account of *Tompteris euchæta* an enlarged figure of the muscles pertaining to the second cirri. The arrangement thus figured differs, however, from that in the well-preserved examples of *T. kefersteini*; some appear to have been ruptured from their connections. The muscles of this important organ group themselves chiefly around the base of the spine. Thus in front is a powerful *extensor spinæ*, which crosses opposite the brain and passes outward to be inserted along the spine. This may be Chun's *m.* 1, but its fibres in his figure have an antero-posterior direction. On the posterior border of the shoulder a muscle passes from the region of the proboscis outward to be fixed to the spine, thus acting as an *adductor spinæ* on each side. It would appear that the main fibres cross the body to the opposite side—to judge from the complex array of oblique fibres in the region between the second cirrus and the first foot, and such would be in keeping with the arrangement behind. Chun's *m.* 4 would represent this *adductor*, but the posterior ends are free and the fibres slope slightly backward and outward—that is, in the reverse direction to those of *T. kefersteini*. From the rounded base of the spine fibres radiate forward and backward, so that the organ, in view of its wide muscular attachments, can readily be rotated. The separate fascicle *m.* 7 in Chun's figure is in all probability the protrusor of the proboscis.

When fully thrust out the proboscis has an oblique or V-shaped aperture, the anterior edge of the pillar being the longer, the posterior being little more than half the length.

The alimentary canal is, like that of *T. catharina*, quite free from the body-wall dorsally, a constriction separating it from the proboscis in front, while posteriorly a papilla appears on each side of the anus. A median raphe occurs dorsally and ventrally as in the species mentioned, if one may judge from the streak in the preparation, and ventrally bridles at intervals bind it to the body-wall.

Rosa describes this species as possessing a frontal region similar to that of *T. elegans*, Chun, which presents a shallow inflection; brain transversely oval, eyes reddish brown, and with two lenses (Viguier says incompletely divided into four); vibratile organs claviform and latero-ventral in the cerebral region; first cirrus shorter than the frontal tentacle, second about the length of the body; pinna rounded with a continuous margin; rosette absent; gonads in both dorsal and ventral branches of the foot. In alluding to the different views of Apstein and Greeff in connection with the rosette-like organ, Rosa thinks they refer to the hyaline glands and that Apstein's *T. kefersteini* is synonymous with *T. elegans*, Chun.

This is the form described on p. 354 of the Linnean Transactions by Dr. Carpenter, and figured in plate 62, figs. 1–4, as *T. onisciformis*. In his description the delicate transverse wrinkling is partly due to the muscular fibres. He correctly gave the relations of the cœlomic cavity and the somewhat ventral position of the first cirrus (his horn-like appendages). The muscles of the second cirrus he figures as passing from the spine to the wall of the movable base and quite independent of the trunk. He describes the feet as transversely wrinkled like the body, and his figure presents circular lines all round, but he gives an interesting account of their motion. He rightly observed the protrusors and retractors of the proboscis. His "ovoidal cells" of the intestine are too large. His "axis band" passing along the *dorsal* surface from the cephalic mass is probably the dorsal raphe of the gut. He detected nerve-fibres to the cirri and nervous elements in them apparently connected with the pigment-spots.

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[*] 'Der pelagische Thierwelt,' &c., Königsberg, Taf. iii. fig. 2 (1888-9).

Dr. Carpenter[*] captured what he considered "another phase of the same type" as *T. kefersteini* with a caudal prolongation—"its structure being in every respect the same." It had sixteen feet, instead of ten. In this he describes and figures two-fifths of the body or thereabouts as having the intestine sacculated, a condition not observed on the east coast or elsewhere, and, further, he suggested that the tail might form a bud, but he left this question open. If this form really had first cirri (which he thought were overlapped by the other parts), then it was a long-tailed example of *T. kefersteini*, otherwise it was probably *T. catharina*. It is interesting that he shows in fig. 1 simple crossed fibres passing from the front of one foot to the posterior border of that opposite, whereas in figs. 6 and 7 transverse fibres alone are indicated.

Procured in the bottom-net in St. Andrews Bay, 24th October, 1875, and on other occasions. It occurred in the German Plankton Expedition at a depth of 200–650 metres.

Examples from St. Andrews Bay in October, measuring 8–12 mm., presented a considerable tail, after the manner of *T. catharina*, yet having the first cirrus with the terminal spine clearly marked. The eyes are black, and the general aspect is that of *T. catharina*. The tail in the longest is about a fourth the length of the body, and the tip is somewhat bulbous and rounded, without papillæ. Four or five rudimentary feet occur on the tail arranged as in *T. catharina*. So far as can be observed, the structure of the lobes of the feet agree with those of *T. catharina*, and gonads are developed in both divisions.

The question therefore suggests itself as to whether *T. kefersteini* is a distinct species, or is it, as Carpenter and Claparède suggested, only a young form of *T. catharina*? In almost all the British collections small examples agreeing with Greeff's *T. kefersteini* occur, but very rarely is an example measuring 12 mm. met with. Yet small specimens in all respects corresponding to *T. catharina* likewise appear in the collections, so that it is a complex question. In frontal tentacles, second cirrus, eyes, feet, in alimentary canal, in the development of the gonads in both lobes, and in the presence of a tail in the larger examples the two closely correspond. If therefore the first cirrus should be found to be caducous*, or if a sexual variation were possible, then the identity of the two forms would be established. In the largest examples with the developed tail the gonads at the extremity of both lobes of the feet present a cellular and minutely granular aspect, the granules when more highly magnified (Pl. V. fig. 2) are seen to be enclosed in a cell-wall. From the tip of the hollow lobe of the foot inward a progressive rate of increase of these ovigerous cells follows, until large masses of a rounded form bulge into the space (Pl. V. fig. 2). Such is therefore an ovigerous female having *frontal* tentacles and two pairs of cirri, and yet the general structure is that of *T. catharina*. It has to be remembered that Vejdovsky mentions that in *T. vitrina*, from Trieste, the young forms have the first cirrus longer than the frontal tentacles, whereas they are shorter than the frontal tentacles in young males. Greeff again holds that those bearing the first cirrus with its spine at the tip are not larval forms as Carpenter and Claparède thought, but bear ova, as, for instance, *T. kefersteini*, and this the foregoing remarks corroborate; yet the young specimens of *T. catharina* which have no first cirrus mingled with those having the first cirrus are exactly in the same condition as regards the gonads in both lobes of the foot, are of the same size, and were caught in the nets at the same moment. Some of the small forms, again, which were placed as undisputed examples of the young of *T. catharina*, presented a knob or stump on the site of the first cirrus, so that the remarks of Carpenter and Claparède rest on fact, viz., that the first cirrus may occasionally be removed, though further investigations are necessary. On comparing two vessels—the one containing small examples of *T. catharina*, that is, those devoid of the first cirrus, the other with all the specimens of *T. kefersteini* picked out from various collections at St. Andrews,—the sizes of the former were, on the whole, a little larger, but both contained small examples of ten to eleven feet; most of these, however, pertained to the vessel of *T. kefersteini*, and both showed a few with developing gonads in both divisions of the feet, and a few in each vessel with tails. On the whole, the evidence leans to the separation of *T. kefersteini* up to date, and it is a form widely distributed in European waters.

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[*] Op. cit. p. 356.

Tomopteris septentrionalis (Steenstrup), De Quatrefages.—In glancing at a series of this species, one feature immediately distinguishes it from *T. catharina*, viz., the general uniformity of size and, besides, the absence of long tails (whilst the feet on each side of these are closely arranged and comparatively large), the deep fissure between the frontal tentacles, and the presence of ova in examples considerably smaller than the average females of *T. catharina*. The average length ranges from 10–14 mm.

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* Malaquin holds that these have no nerve-twig and are temporary structures (Arch. Zool. Expér. 3 sér. t. vii. p. ii R. & N.); the presence of ova and a tail, however, were not known to him.

In British waters Southern * took it in large numbers off the west and south-west coasts of Ireland and outside the 100-fathom line, and more frequently and in greater numbers than *T. catharina* or any other species of the genus. In the month of May no less than 2390 examples were captured, the species being much more abundant in the spring, and in the series sent for examination some females carried large ova in that month. In contrasting this species with *T. catharina* the frontal gap is larger (Pl. II. fig. 1), and instead of the small central boss a larger one occurs in *T. septentrionalis*, the anterior curve extending on each side of the gap; this larger process below being the frontal border of the head, whereas in *T. catharina* it is a small process or a fold of the tentacular margin. There is a trimness in the outline and a grouping of comparatively large feet at the tail characteristic of *T. septentrionalis*. Mr. Southern observes that the first three pairs of feet have a single apical hyaline gland on the ventral lamella, and that the succeeding feet have these and chromophile glands just below them. The remarkably distinct eyes are brownish or reddish brown, both by direct and transmitted light, whereas those of *T. catharina* are black. A marked feature in the ripe examples of *T. septentrionalis* is the absence of the two pairs of sexual organs at the fourth and fifth feet, so conspicuous in *T. catharina*. All that could be observed was a slight thickening or ridge opposite the first five or six feet, a thickening, however, which seemed to extend to all the rest of the feet, so that this distinction remains. As a rule, the feet toward the posterior end of the body are considerably larger than in *T. catharina*, a fact which gives the region a characteristic feature.

The integument of this species appears to be somewhat thicker than in *T. catharina*, so that the muscular fibres and other structures internally are less easily seen in certain preparations—a condition perhaps due to the technique adopted. Such methods, however, do not account for the differences between this and *T. catharina* in regard to the alimentary canal, which, in the latter case, can readily be removed, since it is fixed only on the ventral surface by small bridles segmentally, whereas in *T. septentrionalis* the canal is adherent to the body-wall (Pl. V. fig. 3), which, when slit longitudinally, exposes a slightly segmented condition of the chamber (gut) from constrictions placed at somewhat regular intervals opposite each foot. Such, therefore, accounts for the absence of the ova in the longitudinal perivisceral cavity and their occurrence only in the feet. Moreover, the muscular fibres—both longitudinal and oblique—are stronger (coarser) than in *T. catharina*, though they seem to follow the same plan. The space between several of the posterior feet enables the ventral longitudinal fibres to bulge outward in contraction of the body. The crossed fibres spreading out in each foot are remarkably strong.

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* Irish Fisheries Branch, Sc. Investig. 1910, No. iii. p. 20. I am much indebted to Dr. Stelfox of the National Museum, Dublin, for the opportunity of examining specimens of this and the other species procured by Mr. Southern.

The examples of this form in the British Museum were obtained in the E Atlantic, 51° 21 N., 12° 9 W. In general form they approach that of *T. carpenteri*, though less broad, the posterior end terminating in a small anus No distinct gap occurs between the frontal tentacles. The glands in the feet are indistinct. There is no long tail.

This form is said to frequent the colder water of the Atlantic and Greenland, and has been obtained at a depth of 800–1000 metres.

The proboscis (Pl II. fig 6) has an even smooth rim, instead of the oblique aperture in *T. catharina*, and it is less trumpet-shaped than in *T. nisseni*, the exposed region being short and the margin narrow.

Tomopteris nisseni, Rosa.

This form, as Southern states, is characterised by the massiveness of the body and the presence of a tail. He found an example 65 mm long with twenty-nine pairs of feet on the trunk and five rudimentary ones on the tail, each of which had two coloured hyaline glands. The eyes are clear brown with two or three lenses, and lie on the centre of each cerebral lobe. Rosa states they are visible laterally. The preparations kindly sent by Dr. Stelfox from the Dublin Museum were much folded and considerably softened, and the eyes were invisible. The tails appeared to be proportionally shorter than in *T. catharina*, the feet were so softened and woolly that their finer structure was obscured, though it was clear the lamellæ were frilled and that a large chromophile gland existed in the ventral lobe. The frontal tentacles (Pl. II fig 4) are comparatively thin, large, and long, curve backward somewhat abruptly to the median gap, and often show two small folds between them, though these, of course, vary with the condition of the edges of the tentacles, whilst the frontal edge of the head retains its convexity. The head and neck are comparatively small In the preparations they were thin, probably from softening, the first cirri are absent, the second are very long (once and a half to twice the length of the body, *Southern*) The probocis (Pl I. fig 2) is fully extruded in all, and has the characteristic shape of a large symmetrical and expanded trumpet, with the edge in some finely striated.

The alimentary canal does not separate freely from the body-wall as in *T. catharina*, but it is less closely fixed to it than in *T. septentrionalis*, since a cylindrical mass can be separated from the body-wall, but it has a rough investment as if delicate strands had been ruptured. Instead of the finely areolated aspect of the intestinal wall of *T. catharina*, there is here a complex coat of longitudinal and circular fibres (Pl. IV. fig. 4), indistinct areolæ, and conspicuous, clear, circular globules. The interior of the canal also is less smooth than in *T. catharina*—indeed, the entire tube differs under a lens. The clear round globules seem to be in the areolated mucous lining of the gut, as shown in the figure, the muscular wall rendering them more or less obscure except at the ruptured edges. The mucous investment of these formed homologous areas to the more definite areolæ of *T. catharina*, though proportionally smaller and less definite (Pl. IV. fig. 4), as well as softer. The reason for the differences in the alimentary canal in this species and in *T. septentrionalis* has yet to be ascertained, but it is an important one, and may not be altogether due to the nature of the food

A large specimen and three smaller (13-14 mm.) in the British Museum (1901. 9 15 1), the larger measuring 42 mm. and labelled *T onisciformis*, come from the Faroe Channel, 1896, at a depth of 100 fathoms. The ciliated nuchal organs are normal, and there is no first cirrus. The ventral division of the foot shows a large chromophile gland, though its development is much less than in the African form The tail is long, with rudimentary feet. No ova occur in the large specimen, but in the smaller these are present. No gap occurs between the frontal tentacles, which are large. This is probably *T. nisseni*.

An example sent from Cambridge, and labelled *T. nisseni*, was procured in the E. Atlantic, 50° 16′ N., 11° 27′ W. (24. viii. 07), at a depth of 400-800 fathoms by the trawl. It has rather long frontal tentacles, but it is badly preserved. Gonads occur in both dorsal and ventral divisions of the feet, and thus it differs from Rosa's definition - since he states that these occur in the dorsal only and from the second foot backward.

An example in the British Museum from the E Atlantic, 50° 16′ N., 11° 27′ W., procured in the trawl at 400-800 fathoms (sounding 770 fathoms), has long frontal tentacles with a gap between, but is so imperfectly preserved that recognition is doubtful. It presents gonads in both dorsal and ventral lobes, whereas the type has these only in the dorsal division.

T. nisseni was described by Rosa from the South Atlantic, and Southern found it not uncommon in the northern offshoot of the Gulf Stream to the west of Ireland, and he also examined examples from the south of Iceland.

Tomopteris cavallii, Rosa (*fide* Southern).

This form somewhat resembles *T. septentrionalis* in general outline of the body, being devoid of a long tail and having the feet similarly developed on each side posteriorly. The prostomium (Pl. II. fig. 5), however, diverges, since no median fissure occurs between the frontal tentacles, the anterior margin proceeding continuously from side to side.. Moreover, a median line is visible both dorsally and ventrally in viewing the body. A pair of reddish-brown eyes occurs a little behind the frontal tentacles. Rosa describes the body as ovato-lanceolate, yet the diminution toward the tail is marked in every case. He gives fifteen pairs of feet, a thick neck, a large fissure between the frontal tentacles, and bright brownish or yellowish eyes. The vibratile organ passes backward to the posterior margin of the brain. The first cirrus is absent, and the second is two-thirds the length of the body. The pinnal glands of the fourth are large, and only chromophile, yet in his (Rosa's) figure he shows a hyaline gland above the chromophile. The gonads occur only in the dorsal division from the first to the ninth foot. The sexual fissure was not seen. Southern again observes that this is the rarest of the four species found off the west coast of Ireland, and says there is little to add to the description of Rosa, though his specimens were twice the length of Rosa's, and had seventeen to twenty pairs of feet, "the three anterior pairs bear no gland, but they have a considerable amount of yellow pigment in the wings. The succeeding feet have each a single large chromophile gland on the lower margin of the ventral wing." "In May young specimens were found in which the foot-glands were small or absent. Ova were found free in the body-cavity in November." He does not allude to the frontal tentacles.

The gut-wall in this form, so far as can be ascertained, is attached to the wall of the body, as in *T. nisseni*, and cannot be removed from it without rupture. The fragments (Pl. III. fig 6) present a wrinkled surface, longitudinal muscular fibres (but whether of the body-wall or intestine is uncertain), and an areolated granular surface with larger clear globules in the areolæ, which are less distinct than in *T. septentrionalis*, and much less so than in *T. catharina*.

The proboscis (Pl. I. fig. 5) seems to be short, projects very little in a lateral view, and has an aperture somewhat resembling that of *T. catharina*--that is, prolonged posteriorly where there is a gap in extrusion.

The preparations showed that, as already observed by Rosa and Southern, the gonads occurred in the dorsal division only, and that there was a large chromophile gland at the lower margin of the ventral division.

The essential feature of difference between the Irish examples and the description of Rosa is the continuity of the frontal tentacles. No gap occurs between them, whereas Rosa observes that there is a large fissure between them. This is an important feature, and, if these observations are correct, the Irish form should receive the name of *Tomopteris southerni* or, at least, *T. cavallii*, var. *southerni*.

The species has been found in the South Atlantic, the Pacific, and the Indian Oceans, as well as off the west coast of Ireland.

The examples of *T. cavallii* in the British Museum came from the East Atlantic and were sent from Cambridge. In some the frontal tentacles present no gap, in others a slight gap and a central process occur.

Food of Tomopterids.—Besides the instances in which examples of *T. kefersteini* were found in the mouth and gullet of *T. catharina*, another female had several long masses of a minutely granular soft tissue in the intestine in October.

2. *South African and other Tomopterids.*

A careful description of *Tomopteris carpenteri*, De Quatref., is given by Benham * from examples procured at Commonwealth Bay by the Australian Antarctic Expedition in 45-50 fathoms. He describes the anterior margin as having no median notch, the frilled membrane being continued from side to side. The ciliated epaulettes are "distinct, narrow, slightly curved with the convexity mediad In indifferently preserved examples they assume a triangular form with the base external" There is no first cirrus. The gap is longer between the cirrus and the first foot than that separating the subsequent feet. The ventral pinna has two glands, the hyaline and chromophile, the former capped by a dark orange or reddish-brown mass of pigment, and lies just dorsal of the apex of the ventral ramus, and begins on the third foot. The chromophile gland forms a thickening of pale buff colour, and begins on the fifth foot, and extends to at least the twentieth. The two larger specimens were males, "and the young testis is situated in the dorsal lobe of the foot, along the roof of its cavity." *T. septentrionalis*, Steenstrup, was represented from the same locality at a depth of 30–100 fathoms by several specimens from 5–15 mm. long. He found hyaline glands in the first three feet, and at least in the twelve subsequent feet. Eyes brown.

The South African form (Pl. III. fig. 1) differs, therefore, from that described by Prof. Benham in having a finished gap between the frontal tentacles, in the somewhat shorter space between the bases of the second cirri and the first foot (though this feature depends on the state of contraction), and perhaps in the greater development of the button-like chromophile glands (Pl. III. fig. 3). Moreover, it has a conspicuous tail. It disagrees with the description of De Quatrefages and Rosa in having a long tail, but it has about the same number of feet. The vibratile bands are not triangular (*Rosa*), and the dorsal branch of the foot can scarcely be held to form a right angle either with the foot or the ventral branch, and it contains the ovary. The margin of the wing or lamella is crenate and extends on the foot. It agrees in having the sexual apertures on the fourth foot (Pl. III. fig. 2). Rosa thinks *T. carpenteri* comes near *T. nisseni*, which he only saw in preservation in the Museum at Hamburg, and the wide distribution as well as the structure would appear to warrant their relationship. The Hamburg specimen measured 17 mm. in length and 6 mm. at its widest part, thus it was a comparatively small specimen. It had twenty-five pairs of feet, the neck was short, and there was a large gap between the frontal tentacles. The eyes were large, reddish brown, and visible laterally. The first cirrus was absent, the second very long. No rosette. The gonads occur only in the dorsal division of the foot, and though he, and also Southern, did not see the sexual apertures, in all probability they occur in the fourth foot. The chromophile glands are conspicuous from the fourth foot backward, and Southern testifies to their button-like appearance on the lower margin of the ventral wing. Taking all the facts into consideration, and in view of variations, it would seem to be closely allied, yet the Cape form presents the large ova rolling freely in the feet and here and there over the alimentary canal dorsally, which could not well take place in *T. nisseni*. The dorsal wall of the canal can readily be distinguished and separated from the body-wall, but posteriorly it is fixed by bridles, so that the ova can less freely roll there than in *T. catharina*, whereas, in front, the intestine separates readily dorsally and laterally, but is fixed by the ventral bridles. Only cellulo-granular debris, apparently from the gut-wall occurred in the canal. A dorsal and a ventral raphe probably are present, but they could not be distinctly seen in the example. The gut-wall is highly muscular, and the areolated glandular lining is well developed. The ventral nerve-cords form broad bands slightly constricted at intervals, so as to be somewhat moniliform, but the action of the formalin has to be taken into account. The distribution of this form is extensive, since it ranges over the Atlantic from the Cape of Good Hope to the western shores of Ireland and as far as 20° S. and 27° W. Closely-allied forms occur in the Antarctic seas. Off the western shores of Ireland Southern generally procured *T. nisseni* at considerable depths from 170 to 900 fathoms, and, whilst it occurred at all seasons, it appeared to be most abundant in November, when from twenty to forty examples were captured in the mid-water trawl. In any case the warmer months gave fewer specimens.

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* Austral. Antarc. Exped. 1911-14, vol. vi. Part 3, p. 61, pl. viii. figs. 64-66 (1921).

Tomopteris carpenteri, De Quatref., var., from No. 45 at 100 fathoms from Cape waters, lat. 33° 46'·00 S., 17° 13''·00 E., 500 fathoms. In mud. The example measures 55 mm., of which the long tail measures 13 mm. Anteriorly (Pl. III. fig. 1) the frontal tentacles curve backward and slightly outward at the median base, with a distinct gap between them, the intermediate area presenting two minute, faintly marked bosses or papillæ. The edges of the scimitar-like tentacle are thin, but the base posteriorly forms an elevated mass which gives a character to the organ, which has an opaque streak along the centre—like a diaphragm. The short neck slopes outward to the base of the long second cirri, the ciliated epaulettes marking the bases of these and forming a double row of cilia on each side, their direction being forward and outward to the dorsal edge of the neck, where they cease. Benham in the poorly preserved Antarctic form thinks the outline of these approaches De Quartrefages's figure (pl xx.), but this figure is too indefinite and it does not resemble the condition in the Cape specimen. The bases of the long second cirri agree with those of other forms, and they extend backward fully the length of the body, and the thin enveloping tissue forms a web for a considerable distance along the spine. The body has a fusiform outline, as a whole—tapering, however, posteriorly to the slender tail.

There are twenty-nine feet with the frilled margin to the small wing, and the large button-like gland occurs on the ventral one. This thickened glandular cushion forms a marked feature when the animal is placed on its dorsal surface, and each in the preparation (formalin) points outward and forward. They are conspicuous from the fourth to the twenty-fourth foot. Benham, in the Antarctic form, gives from the fifth foot. Above the button-like cushion is a hyaline gland and a dark pigment-spot (Pl. III. fig. 3). The specimen is a female, and the feet and cœlomic cavity are crowded with large ova, the gonads occurring in the upper lobe, in which a cluster of small ova lies. The size of these would lead to the supposition that the larval *Tomopteris* must be of considerable bulk. The dorsal and the ventral divisions of the foot are short, and the free lamella or wing beyond is also limited. The tail is long, narrow, and much softened, but at least eight or nine rudimentary feet are present. No ova occurred in it. In the preparation the dorsal surface of the body presents a longitudinal line of elevations—one opposite the base of each foot; whilst ventrally there are three—a central and a lateral on each side in similar positions. The genital aperture (Pl. III. fig. 2) is a small circular pore on each side at the base of the anterior border of the fourth foot (Pl. III. fig. 2, *ga.*), thus differing from the ovoid slits figured in other forms. In this connection it is interesting that these apertures are in an analogous position of the two ovoid slits in *Tholepus cincinnatus* from the Cape.

A large *Tomopteris*, measuring 85 mm. in its injured condition, has no locality attached and can only be imperfectly described. The translucent cuticle of the sabre-shaped frontal tentacles alone remains, but if one may judge from the slope of the inner parts an interval occurred between them, and possibly two small elevations existed there. The second cirri are of great length, fully three-quarters that of the body, and their elasticity after extension is characteristic, enabling the organ to assume its original position without muscular action. Such would seem to be a special provision in the group. In the preparation a double row of elevations appears along the body, both dorsally and ventrally, one opposite each foot. The tip of the tail has been ruptured, so that its condition is uncertain. Thirty-six to thirty-eight feet seem to be present, but the injured posterior end causes ambiguity. The tip of every foot was carefully examined, and no trace of the cushion-like disc characteristic of *T. carpenteri* was seen—indeed, those best preserved negatived the possibility of its presence, and pointed to this being a different species, but this is uncertain. In the preparation the feet and their lobes were wrinkled, and the latter appeared to be more or less rounded. The diagnosis, therefore, by the glands of the pinna in such a case was not possible. The tissues of this large form appeared to be more solid than usual, and the ventral nerve-cord and its transverse branches could readily be followed as they passed outward in the elevated areas or ridges on the ventral surface. The intestine, which formed a firm corrugated tube, is bound to the cœlomic wall by a series of regular and somewhat closely arranged bridles (Pl. III. fig. 4) along the middle line dorsally and ventrally—the most perfect series yet observed—the gut however, being otherwise quite free from the body-wall. The proboscis was not extruded, the mouth forming a puckered aperture in the usual position. Moreover, the cœlomic cavity contained masses of what appeared to be sperms, though no tails could be distinguished.

A revision of the specimens of *T. carpenteri* in the British Museum* ('Challenger,' etc.) was made with the following results. The specimens were procured between Kerguelen and Macdonald Island. This form is recognized by the absence of a tail, the comparative breadth across the feet, by the slightly nodulated condition of the middle of the frontal tentacles, thus making a distinction between the two. The ciliated epaulettes are distinct, but the forward position of the shoulders (bases of second cirri) alters the appearance of the parts. The chromophile gland on the ventral web of the foot does not show the cup-like or button-shape of the example from the Cape. The tail, again, terminates in a small tip (anus), the whole tail, however, forming a broad process of diminishing feet. The length of an average form is 27–28 mm.

A specimen from the voyage of the 'Discovery' (19. 20. 01), 54° 01¼″ S., 170″ S.E., measures 10 mm., with eighteen to nineteen feet, and is devoid of a tail. There is a slight depression between the frontal tentacles, and the ciliated grooves are normal. So far as could be observed, a chromophile gland occurred in the ventral division of the foot and a hyaline gland with a pigment-spot above it.

Several forms approached *T. catharina* in the collection. Thus, one labelled by Dr. Baird as *T. onisciformis* (69. 5. 22) from Greenland appeared to be similar, but had no tail, and the feet were so decayed that their structure was obscured. Another procured by the 'Knight Errant' on 28th July, two on 4th to 7th and others on 28th and 30th August, 1882, from the surface down to 40 fathoms. The latter resembled the common forms with tails. A slight gap occurred in many between the frontal tentacles. One had ejected the proboscis in folds. They occurred along with *Arachnactis*. A similar *Tomopteris* was obtained in the 'Triton' at the surface of the Atlantic, besides various examples from 25 miles east of the Island of May along with *Sagitta*, and from St. Andrews.

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* I am indebted to the courtesy of Sir Sidney Harmer, Dr. Calman, and Mr. Carmichael Munroe for facilities in examining the examples in the British Museum.

A *Tomopteris* (1919. 11. 1), W. Q., 38 mm. long, procured by the 'Discovery,' lat. 57 25¼ S., long. 151° 43′ E., had a peculiar shape, for the body tapered posteriorly to join the tail, and thus contrasted with the 'Challenger' form with its broad posterior region. There were, including those on the tail, twenty-five feet, but unfortunately these were so injured that no observations could be made in regard to their glands. The ciliated epaulettes were normal, and the bases of the second cirri were close to the frontal tentacles. The caudal feet were regularly graduated from the larger in front to the smaller at the tip, and all were visible.

Several other forms occur in the collection made by the 'Discovery.' The first (W Q., 1911. 11. 1. 13, 18-24. 6. 04) was obtained at five fathoms (No. 58), 19° 45′ S., 154 48′ W., and measures about 4·5 mm. and has eleven feet. There is no tail. The division between the frontal tentacles is marked by a small eminence, each dipping in on its side. A large chromophile gland occurs in the ventral lobe. No first cirrus is visible. It is probably a young form. The other is about 8·5 mm. long and has nineteen feet, and was got at No. 8 hole (216), W. Q. (20. vi. 02). The tail is short, and a considerable distance exists between the second cirrus and the first foot. A third preparation (7 1. 02) consists of three small specimens 6–9 mm. long and with fourteen to fifteen feet. No tail. The vibratile organ is normal. The gonads occur only in the dorsal division of the feet, which are somewhat lobate, and traces of a chromophile gland appear at the tip of the ventral division. A fourth (29. 7. 03) from No. 2 hole (226), in 10 fathoms, is similar.

8. *On a Post-Larval Terebellid on a Medusa.*

Post-larval Terebellids are very common in the bottom tow-nets in St. Andrews Bay from July to September—some in their translucent tubes, and others, in an older condition, entirely free—amidst a multitude of small Medusæ, the Actinula stage of *Tubularia*, young stages of *Peachia*, many species of *Hybocodon*, *Sagitta*, *Tomopteris*, and other forms. Two of the older Terebellids were attached to the margin of the umbrella of a Medusa apparently outside the tentacles by the anterior end, their bodies hanging freely in the water (Pl. IV. fig. 5). No sign of entanglement or of injury by the thread-cells could be seen, and thus it was a question whether these young forms temporarily adhered to the Medusa, like *Peachia*, and were carried throughout the water after the pelagic stage in the transparent tube, or had been entangled by the thread-cells of the tentacles and captured for food. The Terebellids were in the most advanced stage of the series, probably just before settling on the bottom, and it may be that they desired a longer period of freedom by the help of the Medusa. They were so perfect in outline that at first sight it was thought they might be parasitic Syllids, such as Dr. Crossland found on Nemerteans in the Red Sea, or as H. Eisig discovered on the fins of the Italian eels.

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1. General view of the muscular system in *Tomopteris kefersteinii*, Greeff. Under a low power.

Fig. 2. Extruded proboscis of *Tomopteris nisseni*, Rosa. Enlarged under a lens.

Fig. 3. Lateral view of the extruded proboscis of *T. catharina*, Gosse. Similarly enlarged.

Fig. 4. View of the same from above.

Fig. 5. Lateral view of the extruded proboscis of *T. cavallii*, Rosa. Similarly enlarged.

Fig. 6. Lateral aspect of the extruded proboscis of *T. septentrionalis* (Steenstrup), De Quatrefages.

PLATE II.

Fig. 1. Cephalic region of *Tomopteris septentrionalis* (Steenstrup), De Quatrefages, from Mr. Southern's series: *ep*, ciliated epaulettes. Enlarged under a lens.

Fig. 2. Cephalic region of *T. catharina*, Gosse, St. Andrews. Similarly enlarged.

Fig. 3. Cephalic region of *T. kefersteinii*, Greeff. Enlarged.

Fig. 4. Cephalic region of *T. nisseni*, Rosa. Enlarged.

Fig. 5. Cephalic region of *T. cavallii*, Rosa, from Mr. Southern's collection. Enlarged.

PLATE III.

Fig. 1. Dorsal view of the anterior region of *Tomopteris carpenteri*, from South Africa. Enlarged under a lens.

Fig. 2. Ventral view of the same, showing the genital apertures (*ga.*) opposite the fourth foot: *m*, mouth; *n*, nerve-cords. Enlarged.

Fig. 3. Lamellæ of the foot of the foregoing; the gonads are in the dorsal fork, whilst the button-like gland is in the ventral branch. Enlarged.

Fig. 4. The intestine (*b*) of the large South African form exposed to show the regularly-arranged bridles of the mesentery. The corrugated wall (*a*) of the body occupies each side, (*c*) the cœlom. Enlarged under a lens.

Fig. 5. Inner surface of the intestine of *T. catharina*, Gosse, showing the glands. The raphe is at the upper edge. × 350.

Fig. 6. Inner surface of the intestine of *T. cavallii*, Rosa, with muscular fibres and glands. The lower edge is more translucent. × 350.

PLATE IV.

Fig. 1. Two ovoid (genital) apertures behind the paired organs in *Tomopteris catharina*, Gosse, St. Andrews, with the surrounding muscles. × 90.

Fig. 2. Foot of the foregoing species showing the complex crossing of the muscular fibres. One of the lamellæ is folded on the right: *a*, raphe of the intestine. × 44.

Fig. 3. Sperm-cells? of the same form. × 350.

Fig. 4. Inner surface of the intestine of *T. nisseni*, Rosa, showing the muscular fibres and glands. × 350.

Fig. 5. Edge of the disc of a Medusa to which young Terebellids are attached. Enlarged under a lens.

PLATE V.

Fig. 1. *Tomopteris catharina*, Gosse, female, with elongated tail, October 24th, 1895, St. Andrews. Enlarged about twice.

Fig. 2. Ovary of *T. kefersteinii*, Greeff. × 350.

Fig. 3. Section of the body and intestine of *T. septentrionalis* showing the imperfect diaphragms. The body-wall is not differentiated in the figure from that of the gut. Enlarged under a lens.

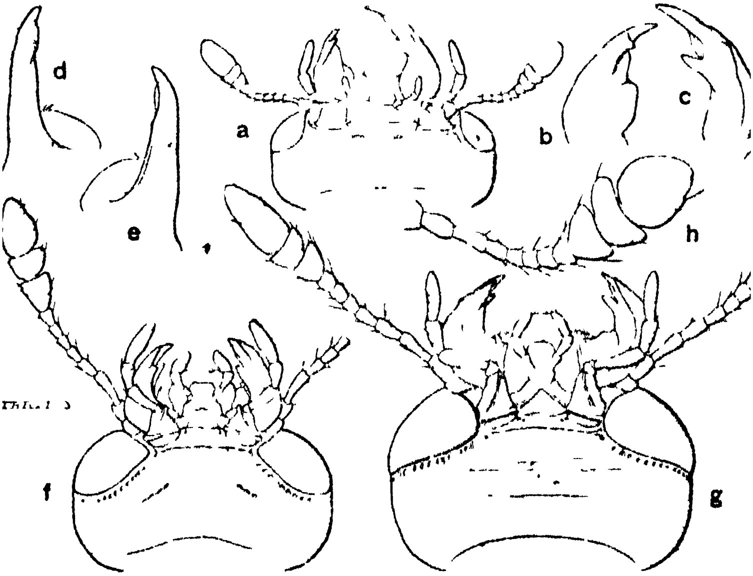
PLATE VI.

Fig. 1. Genital apparatus (one of the two pairs) in *Tomopteris catharina*, Gosse, viewed from the interior, and showing the complex environment of muscles. × 350.

II.—*Studies in* Phalacridæ (I.).—*S. and E. African Forms* [*Coleoptera*]. By G. C. CHAMPION, F.Z.S.

IN the 'Entomologist's Monthly Magazine' for 1924, pp. 161–166, 236–217, various Indian and other Eastern Phalacrids have been described or enumerated, and one of them figured, by myself. In this paper numerous S. and E. African forms are treated in the same way, three or four only having been recorded from the southern portion of that continent. Guillebeau revised and tabulated the genera of Phalacridæ in 1891, but he does not mention a single S. African species. Some of these insects are so like others from widely distant regions that it is quite possible the descriptions of one or two of them would apply equally well to Malayan, Australian, or even American forms—two of them, in fact, I fail to distinguish from Eastern species. *Phalacrus coruscus*, Panz., is cosmopolitan and has been recorded from the Himalaya and Australia, extremely similar forms representing it in many other parts of the world. In dealing with the S. African species I have, as usual, searched for ♂-characters, but, except in one species of *Phalacrus* (*P. cervus*, sp. n.) and one of *Heterolitus* (*H. platycnemus*, sp. n.), nothing of any importance has been detected amongst them. The structure of the mandibles in the first-named genus (noted long ago by Tournier, but not used by him) has been found to afford a valuable aid in defining some of the species: in *P. cervus* (fig. 1, *a*) they are remarkably asymmetric, the left one being greatly elongated and somewhat bent at the tip in the ♂ (suggestive of certain members of the Silphid-genus *Agathidium*) and the corresponding mandible of the ♀ curved distally and not much longer than the right one (fig. 1, *b*, *c*). In the European *P. maximus*, Fairm., the largest species of the genus, the mandibles are asymmetric and short in both sexes (see fig. 1, *g*), very like those of *Tolyphus capensis*, Guér. (see fig. 1, *f*). *P. maximus*, it may be observed, possesses a remarkable ♂-character, viz., the presence of a densely punctured, transverse, pubescent pad along the centre of the apical margin of the second and third ventral segments, but of this there is no trace in the other species of the genus before me. To illustrate the importance of the mandibular structure in certain Phalacridæ, a figure of the mandibles of an Australian *Phalacrinus*, *P. obtusus*, Blackburn, ♂ (see fig. 1, *d*, *e*), is here shown for comparison with the corresponding organs of a very nearly related Eastern genus, *Sphærostilbus*, shown by me in the above-quoted periodical (p. 165, fig. 1, *e*), the two insects otherwise being very similar. Too much reliance, in my opinion, has been placed on at least two of the characters used by various authors in defining certain species of this group: (1) the presence of an incomplete transverse impressed line within the basal margin of the prothorax, which is evanescent in some cases, examples with and without the line occurring in the same localities (*Phalacrus corvinus* and *P. lineopunctatus*, Guilleb.) in India; (2) the sculpture of the elytral interstices, one phase of the dimorphic females of *Tolyphus capensis*, Guér., having the surface dull and

Fig. 1.



a. *Phalacrus cervus*, sp. n., ♂ (Mossel Bay), head from beneath, showing the antennæ, palpi, asymmetric mandibles, &c.; *b*, *c*. Ditto, ♀, mandibles, from beneath; *d*, *e*. *Phalacrinus obtusus*, Blackb., ♂ (Sydney district), mandibles from beneath; *f*. *Tolyphus capensis*, Guér. ♂ (Cape Peninsula), head &c. from beneath; *g*. *Phalacrus maximus*, Fairm., ♂ (Navalperal, Spain), head &c. from beneath; *h*. *Olibrus claviger*, sp. n. (Mossel Bay), antenna.

transversely strigose, the various forms occurring together at the Lion's Head, Cape Town, *T. syriacus*, Reitt. (1884), varying in a somewhat similar way. Since the publication of the Munich Catalogue of Phalacridæ (1868), upwards of fifty genera have been added, mainly by Sharp, Guillebeau, and Casey, as against the original five. The thirty-two species enumerated in this paper are referred to seven genera, and more than half of them are placed under *Olibrus*, Er. All are from the southern portions of the continent, with the exception of the two from Nyasaland.

Collections of these uninteresting beetles frequently include small Hydrophilids, Cybocephalids (Nitidulidæ), and Silphids (*Cyrtusa*, *Colenis*, &c.), these insects bearing a superficial resemblance to the Phalacridæ when the specimens are unset

The material examined, as before, belongs to the British Museum.

TOLYPHUS, Erichson.

1. *Tolyphus* (*Pharcisinus*) *capensis*, Guérin.

Phalacrus capensis, Guér. Icon. Règne Anim., Ins. p. 315.
Lithocrus promontorii, Péring. Trans. S. Afr. Phil. Soc. vi. 2, p. 110 (1892).

♂. Anterior tarsi slightly dilated, joint 2 much wider than 1; mandibles curved, short, armed with a stout tooth before the tip; ventral segments 4 and 5 with a narrow, almost smooth, bare sulcus down the middle, the adjacent area fulvo-pubescent.

♀. Ventral segment 5 only sulcate.

Var. ♀. Elytra subopaque, the cross reticulation more distinct.

Length $2\frac{1}{2}$–4 mm.

Hab. S. AFRICA, Lion's Head and Camps Bay (*R. E. Turner*), Cape Colony (*Mus. Brit.*), Zululand (*sec. Péringuey*).

Sent in numbers by Mr. Turner, both forms occurring at Lion's Head.

The description of *L. promontorii*, Péring., types from Cape Town and Zululand, applies quite well to this species. The larger size, oval shape, smoother head, faintly striate elytra, longer antennæ, &c., separate *T. capensis* from the northern *T. granulatus*, Guér., and its allies. The eye-facettes are equal in size above and beneath, and the S. African species therefore belongs to the section *Pharcisinus*, Guilleb., type *P. punctulatus*, Rosenh. The mandibles (fig. 1, *f*) are short and asymmetric: the left one is tricuspid; the right one is hollowed down the middle within, and has each portion dentate at some distance before the tip. *T. syriacus*, Reitt. (1884), also has an opaque variety (*subopacus*, Sahlb., 1913).

PHALACRUS, Paykull.

1. *Phalacrus cervus*, sp. n. (Fig. 1, *a–c*, mandibles &c., from beneath.)

♂. Oval, convex, very shining above, black with a faint brassy lustre, the mandibles in part rufescent; the head closely, the prothorax and scutellum sparsely, minutely punctured, the elytra with rows of fine conspicuous punctures and the interstices irregularly uniseriate-punctate, the sutural stria nearly reaching the base. Head broad, the epistoma feebly notched in the middle in front; antennæ rather short, the apical joint oval, a little longer than 9 and 10 united; left mandible (fig. 1, *a*) greatly elongated, bent near the base and also at the tip, and armed with a stout tooth at the middle; right mandible (fig. 1, *a*) much shorter, broad at the base, acute at the tip, and dentate near the apex. Prothorax immarginate at the base. Scutellum very broad. Beneath closely punctured and pubescent, the stout metasternal process smoother. Tibiæ broad.

♀. Mandibles curved, the left one (fig. 1, *c*) a little longer than the other and somewhat similarly toothed, the right one (fig. 1, *b*) shorter.

Length 2–2½ mm.

Hab. S. AFRICA, Mossel Bay (*R. E. Turner*: ii., iii. 1922).

Thirteen examples. Distinguishable from the numerous allied forms by the greatly elongated, distally-bent, sharply-toothed left mandible of the ♂, and the highly-polished, distinctly seriato-punctate elytra.

Tournier (Ent. Genev. i. p. 6, 1889) calls attention to this character of the ♂ ♂ of certain Palæarctic *Phalacri*, which is still more pronounced in the S. African insect. He suggests that the Eastern genus *Augasmus*, Motsch., is based upon species with similar mandibles, but this seems to me to be very doubtful, as the type bears no resemblance to the genus he compares it with, viz., *Stereus*, Woll.

2. *Phalacrus laticlava*, sp. n.

Broad-oval, very shining, convex, pitchy-black, the elytra with a large rufescent apical patch, the antennæ, palpi, and legs rufo-testaceous; the entire upper surface sparsely, minutely punctate, the elytra (viewed under a high-power) obsoletely, transversely strigulose, and also with rows of extremely fine punctures, the sutural stria extending forward to about the middle. Head broad; antennæ with a broad, stout, 3-jointed club, joints 9 and 10 transverse, 10 as wide as 11, the latter very large, oval, longer than 9 and 10 united; mandibles moderately elongate (as seen closed). Prothorax immarginate at the base. Scutellum very large. Legs comparatively short.

Length 2¼ mm.

Hab. S. AFRICA, Estcourt, Natal (*G. A. K. Marshall*: 6. ix. 1892).

One specimen. Apparently found with the following species in Natal, from which it is distinguished by the very broad, rufo-testaceous antennal club and the red legs; the reddish apical patch may not be constant.

3. *Phalacrus burrundiensis*, Blackb.

Phalacrus burrundiensis, Blackb. Trans. R. Soc. S. Australia, xiv. p. 101 (1891), Champ. Ent. Mo. Mag. 1924, p. 237.
Phalacrus lineopunctatus, Guilleb. Ann. Soc. Ent. Belg. xxxviii. p. 458 (1894).

Numerous examples from Estcourt and Howick, Natal, Rhodesia, the Transvaal, and Angola seem to me to be inseparable from the Eastern and Australian *P. burrundiensis* Three of the eight from Estcourt have the base of the prothorax distinctly margined along the median third, as in *P. corvinus*, Guilleb (*loc. cit.*).

HETEROLITUS, Guillebeau (1893) (=PARISCHIUS, Guill., 1896).

1. *Heterolitus triguttatus*, sp. n.

Oval, rather elongate, very shining; above nigro-piceous, the front of the head, the lateral margins and a transverse space at the middle of the base of the prothorax, a very large rounded spot on the disc of each elytron below the base, a common transverse subapical patch, and the outer margin testaceous or rufo-testaceous, the antennæ, legs, and under surface testaceous; almost smooth, the elytra with rows of fine conspicuous punctures placed in shallow striæ, the latter more deeply impressed on the apical declivity, the sutural stria sharply defined. Antennæ elongate, the club long and loosely articulated, joint 11 oval, shorter than 9 and 10 united. Prothorax margined at the base in its median third. Metasternal process rather short, scarcely extending beyond the coxæ. Legs long; tibiæ rather narrow, the posterior pair with long spurs, posterior tarsi elongate, slender, joint 1 filiform, a little longer than the others united

Length 2¼ mm.

Hab. S. AFRICA, Port St. John, Pondoland (*R. E. Turner*: v. 1923).

One specimen. A large, sharply maculate form, with shallowly punctate-striate elytra, long antennæ and legs, and an elongate basal joint to the posterior tarsi. *Heterolitus*, Guillebeau (1893), two African species of which were described by him in 1894 (*H. picinus* from Zanzibar and *H. senegalensis* from Senegal), is synonymous with *Parischius* (1896); the two genera are compared by him, but the differential characters are not mentioned. The later name has recently been used by me for various Eastern insects *.

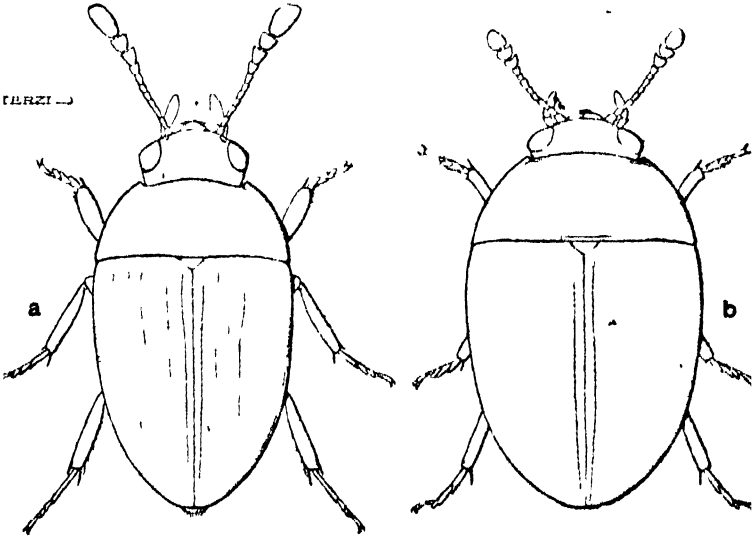
2. *Heterolitus platycnemus*, sp. n. (Fig. 2, *a*.)

♂. Oval, convex, shining, testaceous or rufo-testaceous above, the elytra more or less infuscate in its basal two-thirds, the antennæ, palpi, under surface, and legs testaceous; almost smooth, the elytra sparsely, transversely aciculate laterally and with the

* *P.* (*Litochrus*) *noteroides*, Blackb. (1895) = *Heterolitus* (*Olibrus*) *thoracicus*, Fleut. (1887), var.

usual rows of minute punctures just traceable, the incomplete sutural stria sharply defined, the other striæ visible in one example. Antennæ long, the club loosely articulate, joint 9 triangular, 10 subtransverse, 11 broader, elongate, subconical, as long as 9 and 10 united, submembranous at the tip. Joint 4 of maxillary palpi rather stout, acuminate-ovate. Prothorax immarginate at base. Metasternal process extending forward beyond the coxæ, margined and rounded at the apex, leaving the very short raised basal portion of the mesosternum exposed, prosternal process subparallel, truncate behind. Legs long; tibiæ rather broad, the anterior pair thickened, rounded at the apex externally, tarsi slender, joint 1 of posterior pair very elongate, filiform, longer than the others united. Fifth ventral segment with a V-shaped depression.

Fig. 2



a. Heterolitus platycnemus, sp. n., ♂ (N.W. Rhodesia), × 22, *b. Stilbomimus rhodesianus*, sp. n. (N.W. Rhodesia), × 17.

Length 2–2¼ mm.

Hab. S. Africa, Estcourt and Malvern [type], Natal (*G. A. K. Marshall*: xii. 1902, vi. 1907), Namwala, N.W. Rhodesia (*H. C. Dollman*: iii 1913).

Three specimens. Recognizable by the unusually elongate, subconical eleventh antennal joint, the thickened anterior tibiæ (a character not possessed by any other Phalacrid known to me), the very long, slender, basal joint of the posterior tarsi, and the sparsely, transversely aciculate elytra. The long apical joint of the antennæ removes it from *Heterolitus* as defined by Guillebeau, but this character is of no importance.

The ♀ remains to be discovered.

3. *Heterolitus substrigosus*, sp. n.

Oval, convex, moderately shining; above varying in colour from piceous to ferruginous or rufo-testaceous, the elytra in some examples indeterminately infuscate in their basal half and paler thence to the apex, the legs, palpi, and under surface testaceous, sparsely, minutely punctulate, the elytra also transversely aciculate and with the usual seriate punctures scarcely traceable, the sutural stria deep and sharply defined. Antennæ moderately long, joint 11 oval, not longer than 9 and 10 united, membranous at tip. Apical joint of maxillary palpi slender, fusiform. Prosternal process very narrow, curved downward at tip, metasternal process rather broad, extending forward beyond the coxæ, rounded at tip, almost smooth. Tibiæ moderately widened, the spurs of posterior pair long. Tarsi slender, posterior pair very elongate, joint 1 longer than the others united.

♂. Ventral segment 5 with a shallow **U**-shaped depression.

Length 2–2¼ mm.

Hab. S. AFRICA, Namwala [iii. 1913, type], Mwengwa [vii. 1911], and Shimaponda [viii. 1911], all in N.W. Rhodesia (*H. C. Dollman*), Pretoria (*Hardenberg*); PORTUGUESE E. AFRICA, Xinavane (*Hardenberg*: xi. 1920).

Seventeen examples. Some of these were taken with a ♂ *H. platycnemus* at Namwala, of which it seemed at first sight to be the ♀; but as both sexes are included in the series of the present insect, this cannot be the case. *H. substrigosus* has the prosternal process narrower and not truncate at the tip, the palpi more slender, and the anterior tibiæ less widened in both sexes. *H. picinus*, Guilleb. (1894), based on a single example taken at Zanzibar, is probably a nearly allied form.

4. *Heterolitus obliquenotatus*, sp. n.

Oval, rather elongate, moderately convex, shining, piceous, the head rufescent, the margins of the prothorax, a very large, elongate, oblique space on each elytron at the sides posteriorly, extending narrowly forward along the margin to the base, the legs, and under surface testaceous; closely, minutely punctulate, the elytra also sparsely transversely aciculate, obsoletely striato-punctate, and with a well-defined sutural stria. [Antennæ wanting.] Prothorax immarginate at base. Metasternal process prominent. Tibiæ rather narrow; posterior tarsi with an extremely elongate, slender, filiform basal joint, much longer than the others united.

Length 2¼ mm.

Hab. S. Africa, Port St. John, Pondoland (*R. E. Turner*: v. 1923).

One specimen. Easily separable from *H. platycnemus* and *H. triguttatus*, apart from the difference in the coloration of the elytra, by the very slender and still more elongate basal joint of the posterior tarsus, which is relatively a little longer than in *H. substrigosus*.

Olibrus, Erichson.

The numerous S. African species here referred to this genus may be grouped provisionally thus:—

1 (6). Species more or less metallic above, with antennæ, legs, and under surface wholly or in part infuscate, the tibiæ and tarsi sometimes reddish
2 (3). Species large, metallic (resembling *Tolyphus capensis*), tarsal joints 1–3 broader in ♂ . . . No. 1.
3 (2). Species smaller, tarsal joints 1–3 less widened.
4 (5). Elytra metallic immaculate . . . Nos. 2–7.
5 (4). Elytra brassy-black, maculate posteriorly (except in vars.) . . . Nos. 8, 9.
6 (1). Species black, brassy black, piceous, or ferruginous above, the elytra sometimes with basal half or more black in the pallid forms (Nos. 11, 12) or with a large red apical patch (Nos. 10, 18), the antennæ (except club in No. 14), legs, and under surface testaceous or red.
7 (14). Form oval or elliptic
8 (9). Body broader, black above, the elytra with a large red apical patch . . . No. 10.
9 (8). Body narrower
10 (11). Antennal joint 10 wider than 11; body partly ferruginous above . . . No. 11.
11 (10). Antennal joint 10 not wider than 11
12 (13). Body partly or wholly ferruginous above . . . Nos. 12, 13.
13 (12). Body black, brassy-black, or piceous above . . . Nos. 14–17.
14 (7). Form oblong, black above, the elytra with red apical patch . . . No. 18.

1. *Olibrus tolyphoides*, sp. n.

Oval, convex, brilliant nigro-æneous, the antennæ (the club excepted), the legs in part to a variable extent, and sometimes the labrum also, rufescent; the head closely, the rest of the surface sparsely very minutely punctulate, the elytra (as seen under a high-power) feebly transversely reticulate, and obsoletely or distinctly striate, the striæ finely punctured and the two or three inner ones always well-defined and free on the apical half, the sutural stria nearly reaching the base, and all of them distinct throughout in one example. Head rounded in front, the epistoma short; antennæ with a stout club, joint 10 strongly transverse. Prothorax margined in the median third at the base. Beneath closely punctured and pubescent; metasternal process broad, rounded in front, extending forward to beyond the coxæ, smooth at tip. Legs long; tibiæ moderately widened; anterior tarsal joints 1–3 narrow in ♀, broader and with joint 2 dilated in ♂.

Length 2½–3 mm.

Hab. S. Africa, Estcourt, Natal (*G. A. K. Marshall* : ix., x. 1892).

Four specimens, two of each sex, varying in the development of the elytral striæ. A large brassy form, very like *Tolyphus capensis* at first sight, but with a short rounded epistoma, as in *Olibrus*, and nearly related to the Palæarctic *O. æneus*, F.

2. *Olibrus macropus*, sp. n.

Oval, strongly convex, brilliant brassy-black, the tibiæ and tarsi piceous; sparsely, minutely punctured, the elytra with fine striæ near the suture and traces of other impressed lines on the disc, the interstices (viewed under a high-power) subreticulate. Antennæ long, the club stout. Prothorax margined along median third at base. Elytra narrowing from a little below the base. Legs elongate, tibiæ narrow, the anterior pair unusually elongate, the anterior tarsal joints 1–3 very little widened. Metasternal process as in *O. tolyphoides*.

Length 2¼ mm. (♀)

Hab. S. Africa, Irene, Natal (*Hardenberg*)

One specimen. A brilliant brassy-black form, nearly related to *O. tolyphoides*, with unusually slender, elongate anterior tibiæ, which are narrower than in the same sex of that insect.

3. *Olibrus bevinsi*, sp. n.

Oval, rather elongate, narrowed posteriorly, convex, shining; brassy-black, the tibiæ and tarsi rufo-piceous, the antennæ testaceous, with an infuscate club, sparsely minutely, the elytra more closely, distinctly punctulate and obsoletely reticulate, and with very finely-cut, impunctate, subobsolete striæ, the two next the suture more deeply impressed at the apex, the punctures in the interstices biseriately arranged. Antennæ rather short, the club not very stout. Prothorax obsoletely margined in the middle at base. Metasternal process prominent. Legs elongate, the tibiæ narrow.

Length 2¼ mm. (♀ ?)

Hab. S. Africa, Table Mt (*W. Bevins*).

One example, received by the Museum in 1906. This is one of several S. African species allied to the northern *O. æneus*, F., compared with which it is more elongate, more narrowed posteriorly, and has a less thickened 3-jointed antennal club. The latter is more slender than in *O. tolyphoides* and *O. macropus*, both these insects inhabiting Natal.

4. *Olibrus viridescens*, sp. n.

Oval, strongly convex, shining; black with a greenish or bronze lustre, the antennæ (the infuscate club excepted), palpi, tibiæ, and tarsi testaceous or fusco-testaceous; sparsely, minutely punctured, the elytra with extremely fine, shallow, impunctate striæ, the two next the suture more distinctly impressed, the interstices (viewed under a high-power) feebly reticulate, beneath closely punctured and pubescent, the prominent, anteriorly-rounded, margined metasternal process almost smooth. Antennæ with a moderately stout club. Prothorax obsoletely margined along the median third at base. Elytra laterally compressed, narrowed from a little below the base, rounded at the apex. Legs elongate, the tibiæ narrow, anterior tarsal joints 1–3 slightly widened in ♂.

Length 2 mm.

Hab. S. Africa, New Hanover and Wartburg, Natal (*C. B. Hardenberg*: xii. 1916).

Six examples. A close ally of *O. bevinsi*, type from Table Mountain. The elytra shorter and less acuminate behind, the upper surface greenish. The tibiæ are usually reddish, and the tarsi narrower than in *O. æneus*, F.

5. *Olibrus nigroclavatus*, sp. n.

Oval, convex, the elytra somewhat gibbous, brilliant brassy black, the antennæ testaceous at the base, the club infuscate or black, the palpi and legs piceous, sparsely, minutely punctulate, the elytra with rows of very fine punctures which are placed in two or more (in one large ♀) feeble striæ, the two striæ next the suture finely-cut, always distinct. Antennal club stout in ♂, that of ♀ more slender. Prothorax immarginate at base. Metasternal process prominent.

Length 1¾–2¼ mm.

Hab. S. Africa, Cape of Good Hope (*type, ex coll. Fry*), George, Cape Province (*R. E. Turner*: i. 1922), Durban (*F. Muir*).

Six specimens, the one from George larger than the rest and with distinctly striate elytra. Very near the Palæarctic *O. millefolii*, Payk., the elytra relatively longer and more narrowed behind. The antennal club is always infuscate and apparently stouter in ♂ than in ♀.

6. *Olibrus aeratus*, sp. n.

Oval, convex, shining; of a brilliant brassy tint, the antennæ, palpi, and legs rufo-piceous or infuscate, the mouth-parts and the basal joints of the antennæ usually testaceous; sparsely, minutely punctulate, the elytra obsoletely striate, the two striæ next the suture deeper and sharply defined, free at tip, the scattered punctures placed in the interstices. Antennæ with a rather slender club. Beneath sparsely punctured and pubescent; metasternal process prominent, margined, rounded at tip. Prothorax feebly bordered in middle at base.

Length 1¼–2 mm.

Hab. S. Africa, Ceres [type, xi. 1920], Mossel Bay, George, Aliwal North, Lion's Head (*R. E. Turner*).

Apparently a common insect in the Cape Province, the specimens before me varying greatly in size. Smaller and less convex than *O. nigroclavatus*, the antennal club not so stout (at least in ♂), the upper surface of a more brilliant brassy tint, except in one of the ♀ specimens from Mossel Bay. A single example from Salisbury may belong here.

7. *Olibrus natalensis*, sp. n.

Oval, narrow, much narrowed posteriorly, very convex, laterally compressed, moderately shining, black, with a faint brassy lustre, the antennæ and legs piceous or obscure ferruginous, the basal joints of the former testaceous, sparsely, minutely punctulate, the elytra obsoletely striate, the striæ punctured, the two next the suture well-defined posteriorly and free at tip, the interstices reticulate (in type) or almost smooth between the punctures (var.). Antennæ with a rather stout club. Prothorax immarginate at base. Metasternal process prominent. Tibiæ rather narrow; tarsi slender.

Length 1¼–1½ mm.

Hab. S. Africa, Estcourt, Natal (*G. A. K. Marshall*).

Four examples, found at different dates between August 16th and October 12th, 1892, three (selected as types) with the elytral interstices alutaceous and one with the surface smoother and more shining, almost certainly belonging to the same species. The antennal club is not quite so stout in the smoother form, and the difference in the surface-sculpture may be sexual, but this is hardly likely to be the case. A specimen from the Cape with paler legs and non-reticulate elytral sculpture may also belong to the same species. A very convex small form, scarcely larger than the Palæarctic *O. pygmæus*, Sturm, and allied to the S. European *O. baudueri*, Flach.

8. *Olibrus bohemani*, nom. n.

Olibrus bisignatus, Boh. Res. Eugen. p. 88 (1858) (nec Ménétries, 1849).

♂. Anterior tarsal joint 2 somewhat dilated; ventral segment 5 with a shallow fovea.

Hab. S. Africa, Cape of Good Hope (*type* and *Mus. Brit.*), Lion's Head, Ceres, Grahamstown, Queenstown, Port St. John, Umtata (*R. E. Turner*), Durban, Natal (*Muir*).

The type of this species has a large, rounded, rufous subapical spot on each elytron, as in the northern *O. bisignatus*, Ménétr., compared with which it is less convex, much smaller, and has the antennæ, palpi, and legs partly infuscate. The prothorax is margined in its median third at the base, the fine elytral striæ are almost impunctate and free at the tip, the interstices are reticulate, and the long metasternal process is smooth and bare. A ♂ from Sterkfontein, Transvaal (*Thomasset*), without subapical spot, probably belongs to the same species.

9. *Olibrus rufoplagiatus*, sp. n.

Oval, convex, shining, the elytra duller; black, the antennæ (the slightly infuscate club excepted) and palpi testaceous, the legs and a broad oblique stripe on the disc of each elytron (extending from a little below the base to near the apex, and in one specimen reduced to a subapical patch) rufous, the femora beneath and the under surface rufo-piceous; above sparsely, very minutely punctulate, the elytra also extremely finely reticulate, and with two fine, incomplete, apically-confluent striæ near the suture and an indication of other lines exterior to them. Antennæ with a moderately stout club, joint 11 barely as long as 9 and 10 united, constricted at middle. Prothorax margined at base to near hind angles. Ventral surface closely punctured and pubescent throughout; metasternal process prominent, rounded in front, closely punctured. Tarsal joints 1–3 rather broad.

♂. Anterior tarsi dilated; ventral segment 5 with a transverse depression near apex.

Length 2¼ mm.

Hab. S. Africa, Estcourt, Natal (*G. A. K. Marshall*: ix., x. 1892)

Four specimens. An ally of *O. bohemani* (=*bisignatus*, Boh.) with the rufous subapical spot extending forwards and forming an oblique stripe, the metasternal process closely punctured and pubescent to the tip; the fifth ventral segment with a transverse depression in the ♂ and the anterior tarsi rather broadly widened in that sex. The S. European *O. biplagiatus*, Guilleb., and *O. stierlini*, Flach, are somewhat similar larger forms.

10. *Olibrus pondoensis*, sp. n.

Broad-oval, very convex, black with a faint brassy lustre, the antennæ, palpi, labrum, legs, and a larger apical patch on the elytra, rufous or rufo-testaceous; the head closely, the rest of the upper surface very sparsely, minutely punctulate, the elytra with rows of slightly coarser punctures and an incomplete sutural stria. Antennæ with a rather long, loosely-articulated club, joint 9 triangular, 11 moderately transverse. Scutellum small, triangular. Prothorax obsoletely margined in middle at base. Metasternal process prominent.

Length 2¼, breadth 1¾ mm.

Hab. S. Africa, Port St John, Pondoland (*R. E. Turner*: v. 1923).

One example, somewhat crushed. A large broad form, coloured like *Phalacrus laticlava* from Natal, very different from any other *Olibrus* in the collections before me.

11. *Olibrus claviger*, sp. n. (Fig. 1, *h*, antenna.)

Oval, convex, very shining, rufo-testaceous, the basal half of the elytra black; the upper surface with excessively minute scattered punctures, the elytra also with distinct rows of coarser punctures and a deep, incomplete, punctured sutural stria. Antennæ rather short, with a very stout 3-jointed club, joints 9 and 10 strongly transverse and somewhat produced within, 10 broader than 9 or 11, 11 broad-ovate, short. Prothorax feebly bordered in middle at base. Metasternal process extending forward to a little beyond the coxæ, rounded at tip; prosternal process narrow, hollowed at apex.

Length 2 mm.

Hab. S. Africa, Mossel Bay, Cape Province (*R. E. Turner*: vi. 1921).

One specimen. Differs from all other Phalacrids known to me in the relatively short, stout antennal club, which is formed like that of a *Cryptophagus*. It can be placed under *Olibrus* for the present. The general coloration is like that of *O. mesomelas* from Natal.

12. *Olibrus mesomelas*, sp. n.

Oval, convex, very shining; above black or piceous, with the head, prothorax, and the apical half or third of the elytra, rufous or rufescent, the antennæ, palpi, legs, and under surface testaceous or rufo-testaceous; sparsely, excessively minutely punctulate, the elytra with rows of very fine punctures and a punctured sutural stria. Antennal club moderately stout, shining. Prosternal process very narrow, hollowed at the tip, metasternal process broad, extended forward, rounded in front, the marginal carina extending outward along the coxal cavities.

Length 1¼–2 mm.

Hab. S. Africa, Salisbury (*Marshall*: x. 1899, iv. 1900: type), New Hanover, Natal (*Hardenberg*).

Six specimens, the one with a bright red head and prothorax and the apical half of the elytra rufo-testaceous very like the similarly-coloured *O. claviger* from Mossel Bay, except that the antennal club is normally formed in the present insect. The upper surface is very shining. A smaller example from Estcourt, Natal, may belong here. Three others before me from Madagascar (*Mocquerys*, in Mus. Brit.) are very like the type, except that they have a rather larger eleventh antennal joint. *O. egenus*, Guilleb. (1896) (nec Casey, 1916), from Diego Suarez, is black.

13. *Olibrus rubicundus*, sp. n.

Oval, rather elongate, convex, very shining; ferruginous, the antennæ, palpi, and legs testaceous; the head and prothorax sparsely, minutely punctate, the elytra with regular rows of fine conspicuous punctures, the row next the suture placed along an almost complete, shallow, fine stria, the interstices almost smooth. Antennæ rather short. Prosternal process truncate at tip; metasternal process extending to a little beyond the coxæ, narrowed anteriorly, rounded at tip, leaving the short, transversely-raised basal portion of the mesosternum exposed, the metasternum itself sharply sulcate down the middle posteriorly.

Length 2½–2¾ mm.

Hab. S. AFRICA, Mwengwa [type] and Shimaponda, N.W. Rhodesia (*H. C. Dollman*: vii., viii. 1914).

Three specimens. A brilliant ferruginous form, with rows of fine conspicuous punctures on the elytra and a shallow sutural stria, the latter nearly reaching the base. More elongate and larger than the S. European *O. castaneus*, Baudi, the seriately-arranged punctures on the elytra stronger, the sutural stria only distinct. *O. consanguineus*, Péring. (1892), from Robben Island, compared by its describer with *O. corticalis*, Panz., may be an allied form: it is rufo-ferruginous in colour, with the elytra pale flavous, the infuscate suture excepted.

14. *Olibrus quadristriatus*, sp. n.

Oval, laterally compressed, narrowed posteriorly, very convex; brilliant brassy-black, the antennæ (the infuscate club excepted), palpi, and legs testaceous or rufo-testaceous; sparsely, minutely punctulate, the elytra each with two sharply-cut, finely-punctured, posteriorly-coalescent striæ near the suture, both nearly reaching the base, the other seriately arranged punctures a little coarser than those of the interstices. Elytra somewhat gibbous. Metasternal process prominent.

Length 2–2¼ mm.

Hab. S. AFRICA, Malmesbury (*R. E. Turner*: v. 1920: type), Cape of Good Hope (*Mus. Brit.*), Table Mt. (*Marshall*: viii. 1905).

Three examples. A brilliant, brassy-black, somewhat cuneiform insect, with an infuscate antennal club, clear testaceous legs, and two sharply-cut striæ near the suture on each elytron. *O. evanescens* is its nearest-allied S. African ally.

15. *Olibrus platysternus*, sp. n.

Oval, very convex, brilliant dilute æneo-piceous above, ferruginous beneath, the antennæ, palpi, and legs testaceous, the elytra in certain lights appearing reddish towards the apex; sparsely, minutely, the head more closely, punctulate, the elytra obsoletely striate at the tip and with two extremely fine, posteriorly-coalescent striæ near the suture. Antennal club stout. Prosternal process narrow, widened at the tip; metasternal process very broad, prominent, rounded at the apex, finely margined. Anterior tarsal joints 1–3 slightly dilated in ♂.

Length 1¾–2 mm.

Hab. S. AFRICA (*Mus. Brit.*), Durban (*F. Muir*: type).

Four specimens. A brilliant, convex, dilute æneo-piceous insect, with an unusually broad, prominent, metasternal process, and two extremely fine posteriorly-coalescent striæ near the elytral suture. A close ally of the Indian *O. latisternus*, Guilleb. (1894), and *O. nainiensis*, Champ. (1921), differing from both of them in wanting the definite rows of punctures on the elytra, and from the latter in the obsoletely striate apical declivity.

16. *Olibrus evanescens*, sp. n.

Oval, very convex, brilliant brassy-black, the antennæ, palpi, base of mandibles, and legs rufo-testaceous; sparsely, minutely punctate, the elytra each with two posteriorly-coalescent punctured striæ near the suture, the outer one becoming almost obsolete anteriorly, the other seriately arranged punctures extremely fine. Antennal club rather stout. Sterna and tarsi as in *O. quadristriatus*.

Length 2¼-2½ mm.

Hab. S. Africa, Durban (*F. Muir*) and Estcourt in Natal (*Marshall*: ix. 1892, type).

Two specimens, probably sexes, the larger one with broader tibiæ than the other. A form of the southern *O. quadristriatus* with a non-infuscate antennal club and compressed elytra, the second stria of the latter less sharply defined anteriorly.

17. *Olibrus minusculus*, sp. n.

Oval, narrow, becoming narrower posteriorly, convex, very shining; piceous or nigro-piceous, reddish at the tip, the antennæ, palpi, legs, and under surface testaceous; the head and prothorax with extremely minute scattered punctures, the elytra with rows of shallow conspicuous punctures, which become less distinct towards the sides, and a fine deep sutural stria. Antennæ with a rather slender 3-jointed club. Prothorax feebly margined in the centre at base. Metasternal process narrowed anteriorly, not reaching beyond the coxæ, rounded in front (leaving the transversely raised basal portion of mesosternum exposed), smooth, without definite marginal line.

Length 1¼ mm.

Hab. S. Africa, Estcourt, Natal (*Marshall*: vii. 1892).

Two specimens. A minute, narrow, very shining, piceous insect, with the limbs and under surface testaceous; the metasternal process a little longer than in *Stilbus* and not quite covering the raised base of the mesosternum, the coxal lines wanting. This is the smallest S. African Phalacrid in the collections before me. Single examples from Zululand and Mossel Bay may belong here.

18. *Olibrus rufoterminatus*, sp. n.

Oblong-oval, convex, shining; nigro-piceous or black, the apex of the elytra broadly and the under surface rufo-testaceous, the head and prothorax sometimes obscurely rufescent, the antennæ, palpi, and legs testaceous; sparsely, minutely punctulate, the elytra with an incomplete sutural stria and usually with the rows of minute punctures exterior to it placed in fine striæ. Antennæ with a moderately stout club, joint 11 oval. Prothorax feebly margined in the middle behind. Elytra sharply margined at the sides, the latter subparallel at the base. Metasternal process smooth, extending forward to meet the narrow prosternal process, rounded and margined at tip.

Length 1¾ 2¼ mm.

Hab. S. AFRICA, Estcourt, Natal [type], and Salisbury, Rhodesia (*G. A. K. Marshall*). Chunies Poort, Potgietersrust, and Pretoria, Transvaal (*Hardenberg*)

Numerous examples. An oblong convex form with the apex of the elytra broadly rufous and the sides sharply margined. A much larger, similarly-coloured, more shining specimen (length 3, breadth 1¼ mm.), taken by Hardenberg at "Louis Trichardt," belongs to this or to a closely allied species.

STILBOMIMUS, Champion (1924).

1. *Stilbomimus rhodesianus*, sp. n. (Fig. 2, *b*.)

Broad-oval, convex, very shining; ferruginous, the antennæ, palpi, and legs testaceous; very sparsely, minutely punctate, the elytra with regular rows of fine conspicuous punctures placed in shallow or subobsolete striæ, the sutural stria only sharply defined, the rest of the surface almost smooth. Antennæ rather long, joint 11 oval, much shorter than 9 and 10 united. Apical joint of maxillary palpi thickened at middle. Eyes coarsely facetted. Prothorax margined at the base along median third. Metasternal process short, reaching to middle of intermediate coxæ, as in *Stilbus*; coxal lines wanting. Legs long; tibiæ narrow, the spurs on middle and posterior pairs long; tarsi slender, joints 1 and 2 of posterior pair filiform, subequally elongated.

Length nearly 3 mm.

Hab. S. AFRICA, Mwengwa, N.W. Rhodesia (*H. E. Dollman*: vii. 1914).

Three specimens, sex not ascertained. A close ally of the Eastern *S. polymorphus*, but larger and more elongate, the prothorax margined in the centre at the base, the eyes more coarsely facetted.

2. *Stilbomimus* (?) *nyasanus*, sp. n.

Elliptic, very convex, shining; black, the antennæ, palpi, front of head, and legs rufo-testaceous; very sparsely, minutely, the head more closely, punctulate, the elytra with regular rows of small conspicuous punctures placed along fine shallow striæ, the sutural stria becoming a little deeper than the others on the apical declivity, the broad interstices almost smooth. Antennal club with moderately stout joints. Eyes coarsely facetted. Prothorax without marginal groove at base. Metasternal process short, reaching to beyond the middle of the coxæ, narrowed anteriorly, leaving the triangular mesosternum exposed, the coxal lines wanting. Tibiæ narrow, the spurs of the posterior pair long; posterior tarsi longer than the others, joint 1 a little shorter than 2, oblique at tip, both slightly elongated.

Length 2½ mm.

Hab. E. AFRICA, Mlanje, Nyasaland (*S. A. Neave*: 6. xii. 1912).

One specimen. This species has the meso-metasternal structure of *Stilbomimus*, but the two basal joints of the posterior tarsi are much less elongated. The sutural stria is scarcely deeper than the others. A very convex black insect, with reddish antennæ and narrow tibiæ, &c., superficially resembling an *Anacæna*.

3. *Stilbomimus opalinus*, sp. n.

Broad-oval, moderately convex, very shining, opalescent in certain lights; obscure testaceous, the elytra with the disc of each broadly indeterminately piceous from the base to near the apex, the antennæ, palpi, and legs testaceous; very sparsely, minutely, the head more closely, punctulate, the elytra with rows of very fine punctures and a conspicuous sutural stria, the broad interstices almost smooth. Antennal club with rather small joints. Eyes coarsely facetted. Prothorax feebly margined in the centre at base. Metasternal process short, reaching to beyond the middle of the coxæ, narrowed anteriorly, the coxal lines wanting. Tibiæ narrow, the spurs of the posterior pair long; posterior tarsal joint 1 elongated, reaching far beyond the tibial spurs [the other joints wanting].

Length 2¼ mm.

Hab. E. AFRICA, Mlanje, Nyasaland (*S. A. Neave*: 6. xii. 1912).

One specimen. An oval, moderately convex, opalescent, obscure testaceous insect, with a comparatively narrow 3-jointed antennal club, non-striate elytra (the sutural stria excepted), narrow tibiæ, and a rather long basal joint to the posterior tarsi. It is less convex than *S. nyasanus* and oval in shape, having the general facies of a large broad *Stilbus*, from which it is separable by the elongated first joint of the posterior tarsi.

STILBUS, Seidlitz.

1. *Stilbus dollmani*, sp. n.

Oval, convex, narrowed posteriorly, shining; piceous, the elytra dilute reddish brown, the front of the head, antennæ, palpi, legs, and under surface testaceous; the upper surface subalutaceous, with a few widely-scattered very minute punctures, the elytra with three rows of fine distinct punctures near the suture, the first series placed in a deeply-impressed stria. Antennæ short, the joints of the club rather small, 11 not as long as 9 and 10 united. Prothorax without basal line. Prosternal process bare. Metasternum sparsely punctulate, the process narrow, narrowing forwards, and not reaching beyond the coxæ; coxal lines extending some distance backward and meeting at a sharp angle posteriorly, a narrow space thence to the apical margin of the metasternum almost smooth and longitudinally depressed. Ventral segments clothed with long hairs.

Length 1¼ mm.

Hab. S. AFRICA, Namwala and Shimaponda, N.W. Rhodesia (*H. C. Dollman*: iii. 1913, viii. 1914).

Numerous examples. Near the Palæarctic *S. piceus*, Er., the coxal lines extending far backward and meeting at an acute angle behind. It is quite possible that the above description may apply to species from other parts of the world, so similar are these forms from widely separated regions.

2. *Stilbus angulatus*, sp. n.

Very lkie *S. dollmani* and perhaps a local form of that species, differing from it in its rather larger size, the elytra more narrowed behind and relatively longer, the minute seriate punctures almost obsolete, the antennæ longer and with a stouter club in ♂; the upper surface varying in colour from piceous to ferruginous. The sternal characters as in *S. dollmani*.

Length 2 mm.

Hab. S. AFRICA, Estcourt, Natal (*Marshall*: viii. 1892).

Four specimens.

3. *Stilbus obliquus*, sp. n.

Oval, rather short, convex, shining; rufo-piceous above, rufo-testaceous beneath, the legs and antennæ testaceous, the upper surface with widely-scattered excessively minute punctures, the elytra with three rows of larger distinct punctures near the suture, the first series placed along a deep, anteriorly-obsolete stria. Antennæ slender. Elytra comparatively short, bluntly rounded at tip. Prosternal process strongly ciliate. Metasternum with the central portion trapezoidal and somewhat raised, separated from the depressed lateral spaces by a long oblique groove or line, the process short and rather broad; the raised space with a deep oval cavity in ♂.

Length 1⅜ mm.

Hab. PORTUGUESE E. AFRICA, Xinavane (*Hardenberg*: xi. 1920).

Four specimens. Less elongate than the two preceding species, the metasternum differently formed, and excavate down the middle in ♂ as in the much larger northern *S. geminus*, Er.

POLYALOXUS, Guillebeau (1894).

1. *Polyaloxus striatus*, sp. n.

Elliptic, moderately convex, not very shining, ferruginous; sparsely, finely, the head more distinctly punctulate, the elytra finely, regularly, punctato-striate, the sutural stria not more deeply impressed than the others, the interstices here and there transversely aciculate. Antennæ with a long, stout, loosely articulated, 3-jointed club, joint 11 nearly as long as 9 and 10 united. Joint 4 of maxillary palpi slender, long, subcylindrical. Prothorax immarginate at base. Scutellum rather large, triangular. Metasternal process short, not reaching beyond the middle of the coxæ, the coxal lines wanting. Posterior tibiæ with rather long spurs. Posterior tarsi much longer than the others, joint 1 moderately slender, as long as the others united.

Length 2–2¼ mm.

Hab. S. Africa, Mouth of Umkomaas River, Natal (*Marshall*: ix. 1897: type), Zululand (*ex coll. Fry*), Johannesburg, Transvaal (*J. P. Cregoe*), Angola (*Mus. Brit.*).

Four specimens, those from Zululand and Angola discoloured or immature. Larger than *P.* (*Litochrus*) *pallidus*, Woll., from the Cape Verdes, the elytra more distinctly striate and feebly transversely aciculate, the antennal club stouter.

III.—*The Fishes of the Genus* Gigantura, *A. Brauer; based on Specimens collected in the Atlantic by the 'Dana' Expeditions*, 1920–22. *By* C. Tate Regan, M.A., F.R.S., Keeper of Zoology in the British Museum (Natural History).

[Plate VII.]

I. Systematic.

In the fishes of the genus *Gigantura*, Brauer, the body is elongate and scaleless. The snout is short and the eyes are telescopic, placed close together and directed forwards. The mouth is non-protractile, wide, terminal, with lateral cleft; the rami of the lower jaw are connected by a distensible membrane. The teeth are slender, acutely pointed and depressible; in each jaw a pair of anterior canines, directed forwards and outwards, are followed by a series of strong spaced teeth directed backwards, with smaller teeth between them. There are two small teeth on the vomer, a double series of strong teeth on each side borne by the upper pharyngeals, and a series of 3 to 5 teeth, directed inwards, on the inner face of each ectopterygoid, directly below the pharyngeal teeth. The branchial openings into the pharynx are small and the gills are placed just within the small gill-openings, which are in front of and below the pectoral fins. The fin-rays are unbranched; the dorsal, of 16 to 18 rays, is in the posterior half of the fish; the anal, of 9 to 14 rays, is partly below the dorsal; the caudal is forked, with the lower lobe elongate. The pectorals are long-based, many-rayed, placed high; pelvic fins are absent. There is no air-bladder. The coloration is silvery.

Synopsis of the Species.

P. 29; D. 16; A. 11. Origin of dorsal twice as distant from snout as from base of caudal. Depth at origin of dorsal 8¾ in length. Prolonged rays of caudal longer than rest of fish .... 1. *chuni.*

P. 27-30; D. 17-18; A. 9-10. Origin of dorsal 1¼ as distant from snout as from base of caudal. Depth at origin of dorsal 7 to 8 in length. Prolonged rays of caudal longer than rest of fish .... 2. *vorax.*

P. 40-43; D. 16-17; A. 12-14. Origin of dorsal nearly equidistant from snout and base of caudal. Depth about 10 in length. Prolonged rays of caudal longer than rest of fish .... 3. *indica.*

P. 36-38; D. 16-17; A. 12-13. Origin of dorsal nearly equidistant from snout and base of caudal. Depth at origin of dorsal 13 to 15 in length. Prolonged rays of caudal about ½ as long as rest of fish .... 4. *gracilis.*

1. *Gigantura chuni*, A. Brauer, 1906.

'Valdivia' Tiefsee-Fische, p. 310, pl. i. figs. 1-3.

This species is known from a specimen 118 mm. long, taken in the Gulf of Guinea at a depth of 1200 metres.

2. *Gigantura vorax*, sp. n. (Pl. VII. fig. 2.)

Three specimens, 60 to 80 mm. in length to base of caudal, were taken by the 'Dana' in the Atlantic (12° 11′ N., 35° 49′ W.) with from 2000 to 4000 metres of wire out.

Without direct comparison with the type of *G. chuni* it cannot be stated with certainty that these do not belong to that species; but the differences given in the synopsis, especially the more anterior origin of the dorsal fin, make it probable that they are specifically distinct.

3. *Gigantura indica*, A. Brauer, 1906.

'Valdivia' Tiefsee-Fische, p. 311.

Known from two examples, 55 and 64 mm. long, taken in the Indian Ocean at depths of 2000 and 2500 metres.

4. *Gigantura gracilis*, sp. n. (Pl. VII. fig. 1.)

Five specimens, 75 to 110 mm. long (to base of caudal), were taken by the 'Dana' in the Atlantic, in 13° 7′ N., 57° 20′ W. (2000 metres of wire out), 17° 41′ N., 60° 58′ W. (6000 m. wire), 17° 58′ N., 60° 41′ W. (4000 m. wire), 17° 43′ N., 64° 56′ W. (1200 m. wire), and 22° 6′ N., 54° 58′ W. (1000 m. wire).

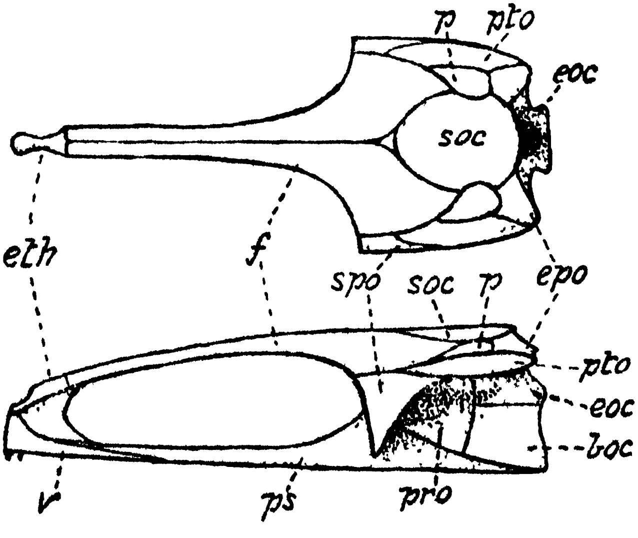
This species appears to differ from *G. indica* in being more slender and also in having fewer pectoral rays and a shorter caudal fin.

II. SKELETON OF *GIGANTURA VORAX*.

(Text-figs. 1–3.)

The skull is elongate; the postorbital part is broad and depressed, with the smooth upper surface somewhat convex from side to side. The supraoccipital is a large, rounded, flattish bone that separates the small parietals; the sphenotic is produced downwards into a pointed projection; there is no opisthotic; basisphenoid, alisphenoid, and orbitosphenoid appear to be absent. The frontals are much contracted between the orbits and the lateral ethmoids appear to be

Text-fig. 1



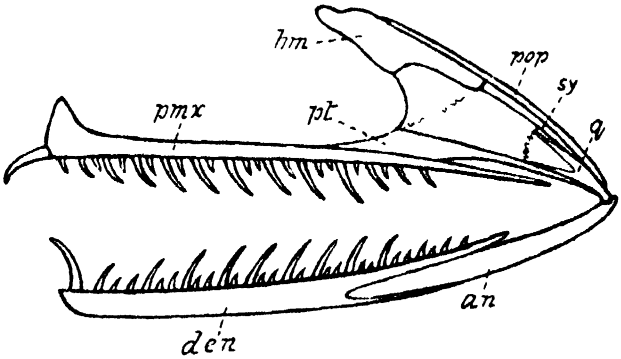
Gigantura vorax, skull, from above and from the side (× 8).

boc, basioccipital, *eoc*, exoccipital, *epo*, epiotic; *eth*, mesethmoid; *f*, frontal; *p*, parietal; *pro*, pro-otic; *ps*, parasphenoid; *pto*, pterotic; *soc*, supraoccipital; *spo*, sphenotic; *v*, vomer.

represented by a vertical plate that connects the parasphenoid and vomer below with the frontals and mesethmoid above.

The mouth is bordered above by a pair of bones that I regard as præmaxillaries, but they may include the maxillaries also; at their anterior end they are expanded upwards and articulate with the vomer and mesethmoid; on the inside each præmaxillary is united to a bone that runs backward to join the quadrate, and may therefore be regarded as the ectopterygoid; this bears a series of three to five small teeth on the inner side. The long and slender symplectic connects the hyomandibular with the quadrate, and between these three and the ectopterygoid is a membrane, scarcely ossified, in which can be detected what appear to be the limits of the other pterygoid bones. The præoperculum is a long and slender splint; the other opercular bones are membranous. The rami of the lower jaw are long and slender, loosely connected at the symphysis, and joined throughout their length by a broad distensible membrane. The lower parts of the hyoid arch and of the branchial arches appear to be unossified, the gills apparently being developed on the upper parts of the arches only.

Text-fig. 2.



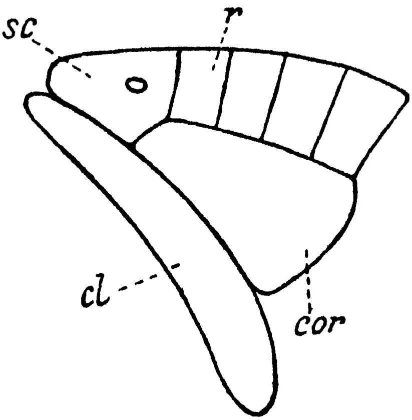
Gigantura vorax, jaws and suspensorium (× 5).

an, angular; *den*, dentary; *hm*, hyomandibular; *pmx*, præmaxillary; *pop*, præoperculum; *pt*, ectopterygoid; *q*, quadrate, *sy*, symplectic.

The pectoral arch is not attached to the skull; post-temporal and supra-cleithrum are absent; the pectoral rays are inserted on the perforate hypercoracoid and on four radials that are attached to the hypocoracoid, all these bones being thin laminæ.

The vertebral column comprises thirty vertebræ; these are cylinders of thin bone, longitudinally striated. In the præcaudal region there are no parapophyses and no ribs and the neural spines are short; the caudal vertebræ have long and slender, backwardly directed neural and hæmal spines.

Text-fig 3



Gigantura vorax, pectoral arch (× 6).

cl, cleithrum; *cor*, hypocoracoid; *r*, radials; *sc*, hypercoracoid (scapula).

III. Relationships of *Gigantura*.

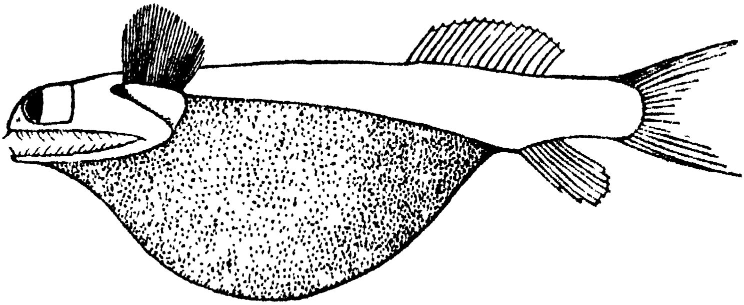
The systematic position of *Gigantura* is uncertain, but it may well be related to the Synodontidæ (*cf.* Ann. & Mag. Nat. Hist. (8) vii. 1911, p. 124). It differs from the Synodontidæ in many features of specialization—*e. g.*, the telescopic eyes, small gill-openings, many-rayed pectoral fins, absent pelvic fins, large supraoccipital, palatines absent, præmaxillaries united to ectopterygoids, branchial skeleton reduced, pectoral arch unconnected with skull, etc. In some of these characters it approaches the Lyomeri (*cf.* Ann. & Mag. Nat. Hist. (8) x. 1912, p. 347), but it is difficult to know what value to attach to this. *Gigantura* may, perhaps, be regarded as a highly specialized member of a group leading from the Synodontidæ to the Lyomeri.

IV. HABITS OF *GIGANTURA.*

From their mouth and dentition it is evident that these oceanic fishes are piscivorous, and from their small gill-openings and elongate caudal rays it is probable that they are not strong swimmers, but, rather, lurking fishes that steal upon their prey, aided by powers of vision beyond the ordinary.

One example of *Gigantura vorax* is especially interesting, for although only 80 mm. long it contains a *Chauliodus* about 140 mm. in length, neatly packed away in its stomach, which is greatly distended. *Chauliodus* has so formidable a dentition that we cannot imagine a *Gigantura* venturing to attack one face to face, and if it seized one by the tail we should expect the larger fish to turn and do the same to its opponent.

Text-fig. 4.



Gigantura vorax. Sketch of specimen 80 mm. long that has a *Chauliodus* of 140 mm. inside it.

An examination of the body of the victim enables us to reconstruct the crime. The *Chauliodus* was seized by the middle, and was swallowed double until it reached the posterior end of the stomach, when its head and tail still protruded from the mouth of its captor; these were then taken in and bent back until the whole fish, now doubly folded, was in the stomach of the *Gigantura.* Digestion has affected the part first swallowed, where the flesh has quite disappeared, exposing the vertebral column for a length of about 18 mm.

When engaged in such a feat the intake of water through the mouth for respiration would be difficult, and it seems likely that the respiratory current enters through the gill-openings and that the pectoral fins may help to direct it.

The specimens of *Gigantura* taken by the 'Dana' were captured with nets fishing at from about 500 to 2000 metres below the surface (1000 to 4000 metres of wire out), but some of them may have been caught whilst the nets were on their way up. Indeed, 2000 metres seems a somewhat excessive depth for a fish of this type; and it is interesting to note that the fish with a *Chauliodus* in its stomach was taken in a net fished with 4000 metres of wire out, and that Hjort has shown that *Chauliodus* is usually to be found about 500 metres below the surface.

EXPLANATION OF PLATE VII.

Fig. 1. *Gigantura gracilis* (natural size).
Fig. 2. *Gigantura vorax* (× 1¼).

IV.—*Description of a new Salmonoid Fish from the Carribbean Sea, obtained by the 'Dana' Expeditions,* 1920-22. By C. Tate Regan, M.A., F.R.S.

Xenophthalmichthys, gen. nov.

Related to *Microstoma*, but especially distinguished by the telescopic eyes.

Xenophthalmichthys danæ, sp. n.

Slender, subcylindrical anteriorly and compressed posteriorly; depth of body 14 in length to base of caudal, length of head 7. Head about as broad as deep; snout short; mouth small, with a few minute teeth; eyes telescopic, directed forward, longitudinal diameter nearly ⅓ length of head; interorbital space narrow. Gill-membranes united, free from isthmus; 3 branchiostegals. About 50 scales in a longitudinal series; lateral line complete, running along middle of side. Fins small. Dorsal 10, above interspace between pelvics and anal; origin a little nearer to base of caudal than to end of snout. Anal 9. Caudal forked; caudal peduncle 7 times as long as deep. Pectorals lateral, narrow, 7-rayed, ⅔ length of head; pelvics 9-rayed, close together, origin equidistant from eye and anal fin. Coloration somewhat silvery.

A single specimen, 88 mm. in length to base of caudal, from the Carribbean Sea, near St. Lucia (14° N., 61° 40′ W., 2500 metres of wire out).

Examples of *Microstoma rotundatum* differ principally in the normal structure of the eyes, the broader interorbital region, the less elongate form of the body, and the more posterior position of the dorsal and pelvic fins.

Winteria, Brauer, is another fish with telescopic eyes that may be a Salmonoid, but it does not appear to belong to the Microstomidæ, and may, perhaps, lead from *Argentina* to the aberrant *Opisthoproctus*.

V.—*On a new Species of the Genus* Polytoreutus *and on a Variety of the same.* By Frank E. Beddard, D.Sc., M.A., F.R.S.

Among a number of Oligochæta collected in British East Africa in the Tanganyika district by Mr. Loveridge, and kindly placed in my hands for examination by Mr. Monro of the Natural History Museum, I found several specimens which represent a new species of *Polytoreutus*. This species, on account of its most salient character, I name *Polytoreutus hexatheca*; I have examined two examples of the worm, and noted the external characteristics of a third, which, though it may not belong to the same species, presents a state of affairs which I have not had the opportunity of seeing before in this genus—the extrusion of the terminal chamber of the prostatic apparatus.

The two examples which I dissected seem to me to be undoubtedly of the same species, though they show a point of difference which is decidedly not common among the Oligochæta, though not unknown. Of the two one shows the external apertures of the generative system to be a segment behind that shown by the other. In one, in fact, the anterior (male) aperture was in the middle line between segments 17/18, but in the other between segments 16/17; in both cases the spermathecal slit-like opening lay a segment behind, *i.e.*, on segments 19/20 and 18/19. This state of affairs in the relative positions of the male apertures is paralleled in the case of *Bothrioneurum iris* *.

Both examples are not large earthworms, measuring about 3 mm. in breadth and some 4 inches in length; the colour on the dorsal side is brownish purple. The setæ were as in other species of *Polytoreutus*—i. e., the more laterally placed couple more strictly paired than the more ventral, which are farther apart. The nephridiopores are in front of the lateral setæ, again as in the genus universally.

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* 'The Fauna of British India: Oligochæta,' by J. Stephenson, London, 1923, p. 102.

The prostomium was not plain in either of these examples as to its ending posteriorly. But in a specimen, perhaps doubtfully of the same species to which reference will be made presently in regard to the protrusion of the prostatic duct or Bursa propulsoria, the prostomium was continued for about half its breadth on to the first segment of the body. This is, moreover, at least a frequent state of affairs in the genus. The clitellum varies somewhat in extent in different species of this genus. In *P. hexatheca* it extends from segments 13 to 16 inclusive. One only of the two specimens which I dissected showed the clitellum, but the development of glandular tissue of 13 was small. Both had perfectly fully developed generative organs. I counted the number of segments which constituted the clitellum by the nephridiopores, as well as by the intersegmental furrows.

The position of the generative pores has been already indicated in this worm. In a third example, which I have also referred to above, the male orifice was capped by a tubular protrusion. This arose from both the segments involved in the male orifice. It extended in a buttress-like way upon the (ventral) surface of both segments. The tissue of the process was smoothly continuous with the tissue of the surface of the body. It suggested, in fact, a permanent process, and not an evolution of a normally involved tube or sac. This may, indeed, be the case, and the two species therefore wholly different. I leave the specimen intact because of this feature, and for the reason that the collector identified it with my *Notykus kilossensis*, recently described by me in these 'Annals' from the same locality *. This identification is certainly not correct, but it obviously indicates a considerable external similarity.

As to the internal characters of this species, I examined one of the specimens after dividing it longitudinally and the other by ordinary dissection from the dorsal surface. Anxious to preserve as many structures uninjured as possible, and also hindered somewhat by the not very favourable condition of the worms, my account is not fully comprehensive. There is not, however, as I think, the slightest doubt as to the fact that the worm belongs to a new species.

* Ser. 9, vol. x. p. 599, Dec. 1922.

There is just a faint doubt as to the inclusion of this species in the genus *Polytoreutus*. The only difference between this genus and *Eupolytoreutus* is the possession by the latter of two pairs of testes and sperm-ducts. I infer from the presence of only a single pair of vesiculæ seminales that the worms described here are to be referred to the genus *Polytoreutus*.

The gizzard is strong and lies in segment 5. I noted the usual three ventrally situated œsophageal glands; but did not see the paired calciferous glands of segment 13. The former were, I feel certain, in segments 9, 10, 11.

The septa were many of them thickened, and these as usual in the neighbourhood of the gizzard and generative organs. These thickened septa divided segments 5 from 13; there were, therefore, eight of them.

There is nothing decisive for the definition of the species in the above facts. It is only by the structure of the generative organs that the species of this genus can be effectively separated from each other. Of these organs I have been able to note facts which are amply sufficient to distinguish the present species from those which have been hitherto described.

The seminal vesicles are, as already mentioned, present to the number of but a single pair. These are long and thin, as is the case in other species of this genus. They are at first merely thin lobes, and later show lateral bulgings which present the appearance of being produced by constrictions. They extend to the end of the prostates, and are thus not so long as in some species. I have not seen their connection above with any testis-sac. Nor were the testes or sperm-ducts investigated. The prostates open into a terminal chamber by means of a muscular duct, which is much thinner than the prostate-glands and is suddenly produced, not being gradually narrowed down.

This termination of the prostates I saw only in one specimen, that with the generative openings the farther forward. The prostates are bent upon themselves, and thus appear about half of their real length on a cursory view. The texture has a soft and glandular appearance, the external muscular layer being probably thin. The surface is furrowed by a number of short transverse furrows, which give to the gland a somewhat moniliform appearance, though not a regular alternation of wider and narrower rings. The elbow-like bending of the prostate allies this species with, e. g., *P. sjöstedti* and *P. meruanus* *.

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* Michaelsen, "Oligochæta," in 'Wissenschaftliche Ergebnisse . . . . Kilimandjaro,' Upsala, 1907, Taf. i. figs. 1, 7.

The transverse furrows recall *P. baralypton*, though they are more numerous in my species, in which the prostate, owing to its doubling, is much longer than that of *P. baralypton*[*].

Another feature of the species with which I deal here is characteristic of other species, but is not general. There is in *P. hexatheca* a single Bursa copulatrix lying behind the other sexual orifices and in the middle line. It is an obviously muscular sac, and cannot be missed. It is single, as in *P. sjostedti* just referred to, and not a paired structure as in *P. fülleborni*, as described and figured by Michaelsen[†].

The spermatheca differs from all the hitherto-described species, but comes nearest in its characters to my species, *P. violaceus*. In the latter the quite unpaired spermatheca is furnished with eight diverticula on each side, as is shown in the figure referred to below[‡]; in the present there are six quite similar diverticula upon either side of an unpaired medianly placed spermatheca. In *P. violaceus* the first diverticulum, which lies in the fourteenth segment as in *P. hexatheca*, differs from it in shape, being much more tubular in form and of about the same diameter throughout. In *P. hexatheca* the same diverticulum is like those which follow in both the species, *i. e.*, egg-shaped.

The first of these diverticula of the spermathecal sac receives, as in other species of the genus, the funnel of the oviduct, which was easily seen to extend to the integument, where it opens on to the exterior and to which was attached the egg-sac. There is, in fact, no difference between the present species and other species of the genus in these organs. Nor does their attachment, apparently, have any influence upon the form of the diverticulum in *P. hexatheca*, as it does appear to have in some other species, where the first diverticulum is of different form. This is, perhaps, important to note—and for this reason: Michaelsen has pointed out[§] that in all probability the first pair of so-called diverticula of the median spermathecal sac are in reality the ends of the originally double spermathecal sac itself, which here diverge from each other and become fused, or (*P. magilensis*[||]) partly fused behind. They are thus different from the diverticula, which lie at (or both before and at) the end of the spermathecal sac, which is nearest to its external orifice.

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[*] Cognetti, "Description of a new Species of the Genus *Polytoreutus*," Ann. & Mag. Nat. Hist. ser. 8, vol. vii., May 1911, p. 508.

[†] "Die Oligochæten Deutsch-Ostafrikas," Zeitschr. wiss. Zool. Bd. lxxxii. 1905, p. 302, Taf. xx. fig. 28, *kt*.

[‡] Quart. Journ. Micr. Sci. vol. xxxvi. n.s. pl. xvi. fig. 7, p. 233.

[§] Zeitschr. wiss. Zool. *l. c.* p. 342.

[||] Beddard, "Two new Genera and some new Species of Earthworms," Quart. Journ. Micr. Sci. vol. xxxiv. p. 248, see pl. xxv. fig. 9.

This view is undoubtedly confirmed by my own* observations upon the development of the spermatheca in this genus, which would appear to have actually preceded those of Michaelsen, though they were probably elaborated about the same time. In this memoir I describe the origin of the spermatheca from a rudiment on each side, which unite in the middle line to form the median unpaired region lying beneath the nerve-cord. This sac, which extends only for a short way towards what will be ultimately its posterior end, is excavated from before backwards, thus showing clearly (as I think) its double origin, and not as a single involution from the external orifice.

Furthermore, the fact that the pouches in question are not diverticula of the spermatheca is shown by the fact that they are compound structures, being composed not only by the ends of the spermathecæ, but also by the ovarian sac into which opens the oviduct. This additional fact appears clearly from my paper referred to. That the alleged anterior diverticula should present a different appearance from the posterior diverticula is at one with the presumed morphological difference between the two. It is the occasional similarity between the two different structures which demands explanation.

It seems to me possible that such cases (*e.g.*, the present species *Polytoreutus hexatheca*) are brought about by a change of function in these anterior divergences of the spermathecal sac from processes connected with the eggs to storage of spermatozoa or causes allied to these. Hence a gradual approximation in likeness, not well seen in many forms, but very apparent in *P. hexatheca.*

In conclusion, the following definition embodies the principal characters of the species *Polytoreutus hexatheca*:—

Length 4–5 in. Breadth about 3 mm. Clitellum xiii.–xvi. inclusive. Male pore xix./xx.; spermathecal pore xvii./xviii. (or both a segment farther forward?).

Prostates bent upon themselves, with many transverse furrows, ending in thin muscular duct. Spermatheca with rather large anterior diverticula (bearing oviduct and egg-sac), and five pairs of diverticula behind extending along whole length of spermatheca. Single median Bursa copulatrix.

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* "On some new Species of Earthworms belonging to the Genus *Polytoreutus*," Proc. Zool. Soc. 1902, p. 208.

VI.—*New or little-known* Tipulidæ (*Diptera*).—XXVI. *Palæarctic Species.* By Charles P. Alexander, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

The present paper is based largely upon Limoniinæ from the mountainous sections of Hokkaido and Honshiu, Japan, where they were taken by my friend Professor Teiso Esaki. A few additional species are from Kiushiu, taken by Professor Hori, and from the vicinity of Kofu, Japan, taken by Mons. de Lezey, and contained in the collection of the Paris Museum. Except where stated to the contrary, the types are preserved in the collection of the writer through the great kindness of the collectors.

Dicranomyia mesosternatoides, sp. n.

Male.—Length about 7·5 mm.; wing 9 mm.

Very similar to *D. mesosternata*, Alexander (Japan), differing as follows:—

Wings with the brown pattern more extensive, the spots at origin of *Rs* and mid-length of cell *Sc* reaching vein *M*; band along the cord broad and diffuse, continued basad along vein *M*; wing-apex more extensively darkened; marginal spots on anal veins larger and more diffuse.

Male hypopygium with the ventral dististyle produced into a long slender rostrum, the spines very long and widely separated from one another, the outer spine on the extreme tip of the rostrum a little longer than the other spine and gently curved; the second spine is on the face of the style itself, at the base of the rostrum, arising from a small papilla, approximately straight. Dorsal dististyle strongly curved, the apex feebly expanded into a small head.

Hab. Japan (Hokkaido).

Holotype, ♂, Akan, Kushiro-no-kuni, September 3, 1922 (*T. Esaki*).

Paratopotype, ♂.

Dicranomyia variispina, sp. n.

Related to *D. basifusca*, Alexander; wings with a strong brown tinge; Sc_1 and Sc_2 both beyond the origin of *Rs*; cell 1*st* M_2 broad; male hypopygium with the spines of the rostrum heteromorphous.

Male.—Length about 5·5 mm.; wing 7·6 mm.

Rostrum and palpi black. Antennæ black throughout, the flagellar segments oval, the basal ones subpyriform. Head dark grey.

Mesonotal præscutum and scutum dark brownish grey, the humeral region of the former more reddish, with small pseudosutural foveæ; scutellum lighter grey, the caudal margin reddish; postnotum dark grey. Pleura dark brown, grey-pruinose. Halteres pale, the extreme base of the stem brighter, the knobs infuscated. Legs with the coxæ infuscated; trochanters obscure yellow; femora light testaceous brown, the tips narrowly darker brown; remainder of the legs light brown. Wings with a strong brown tinge, the stigma oval, darker brown; veins dark brown. Venation: Sc_1 just beyond the origin of *Rs*, Sc_2 at its tip and likewise beyond this origin; R_1 beyond the origin of *Rs* deflected strongly cephalad; *Rs* arcuated; R_{4+5} strongly angulated, the subperpendicular basal third without macrotrichiæ; cell *1st* M_2 broad, at its outer end approximately two-thirds the length of the cell; basal deflection of Cu_1 just beyond the fork of *M*; arculus not conspicuously infuscated, as is the case in *D. basifusca*.

Abdomen dark brown throughout, including the hypopygium. Male hypopygium with the more basal spine of the rostriform appendage arising from a swollen base, much longer than the sessile outer spine. Gonapophyses with the caudal mesal angles produced caudad into a slender black spine, the tip bent strongly laterad, the lateral margin with numerous denticles.

Hab. Japan (Honshiu).

Holotype, ♂, Hinoëmata, Iwashiro-no-kuni, altitude 3280–6235 feet, July 28, 1923 (*T. Esaki*).

Dicranomyia basiseta, sp. n.

General coloration yellowish; rostrum reddish yellow; antennæ dark brown throughout; præscutum with a brown median stripe; wings tinged with yellowish grey, the stigma pale brown; male hypopygium with the cephalic mesal angle of the ventral diststyle bearing a brush of setæ.

Male.—Length about 5 mm.; wing 7·2 mm.

Rostrum pale reddish yellow, the palpi dark brown with the basal segment pale. Antennæ dark brown throughout; flagellar segments oval. Head yellowish grey.

Pronotum infuscated. Mesonotal præscutum yellow with an ill-defined brownish median stripe; remainder of mesonotum pale brown, sparsely pollinose. Pleura yellow, the anepisternum feebly darkened. Halteres pale, the knobs scarcely infuscated. Legs yellow, the tips of the tibiæ narrowly infuscated; basitarsi pale brown, the tips and remainder of the tarsi brownish black. Wings tinged with yellowish grey, the base and costal region somewhat clearer yellow; stigma oval, pale brown; veins brown. Venation: Sc_1 ending slightly before the origin of Rs, Sc_2 some distance from its tip, Sc_1 alone being a little longer than the basal deflection of R_{4+5}; Rs arcuated, about one-half longer than the basal deflection of R_{4+5}; basal deflection of Cu_1 just beyond the fork of M.

Abdomen brown, the sternum even lighter-coloured. Male hypopygium with the mesal face of basistyles produced into the usual conical setiferous lobe, and, in addition, a much larger fleshy lobe that appears to be contiguous across the median line with its fellow of the opposite side; ventral dististyle with the stout rostrum feebly chitinized, bearing near mid-length two spines; cephalic mesal angle of the style likewise feebly chitinized and bearing a dense brush of setæ.

Hab. Japan (Honshiu).

Holotype, ♂, Lake Chuzenji, Shimotsuke-no-kuni, altitude 4170 feet, July 22, 1923 (*T. Esaki*).

Antocha (*Antocha*) *gracillima*, sp. n.

General coloration brownish grey, the præscutum with three ill-defined darker stripes; wings greyish subhyaline, the prearcular region whitened; cell *1st* M_2 long and narrow; male hypopygium with the outer dististyle blackened, bifid at apex; gonapophyses and lateral branches of ædeagus very long and slender.

Male.—Length about 4·2 mm.; wing 5 mm.

Rostrum and palpi brownish black. Antennæ relatively elongate for a member of this genus, if bent backward extending about to the root of the halteres, black throughout; basal flagellar segments elongate-oval, the terminal segments shorter. Head dark brown, pruinose, especially in front.

Mesonotum brownish grey, the præscutum with three very ill-defined dark brown stripes; scutal lobes darker. Pleura brown, vaguely pruinose, the dorsal portion of the pteropleurite paler. Halteres pale, the knobs infuscated. Legs with the coxæ brownish testaceous, brighter mesally; trochanters obscure yellow; legs brown, the femoral bases narrowly paler, more conspicuous on the fore legs. Wings greyish subhyaline, the prearcular region conspicuously whitened; stigma large, pale brown, the margins ill-defined; veins *Cu* and *2nd A* indistinctly seamed with brown; veins dark brown. Venation: *Sc* ending a short distance before the fork of *Rs*, the latter long and straight with a symmetrical fork; *r* bisecting the stigma; cell *1st* M_2 relatively long and narrow, gently widened outwardly, *m* shorter than the outer deflection of M_3; basal deflection of Cu_1 a short distance before the fork of *M*.

Abdomen dark brown. Male hypopygium with the basistyles simple; dististyles broadly united at base; outer dististyle heavily chitinized except at extreme base, the diameter nearly equal throughout the length, the tip narrowed into a slender point with a smaller stouter tooth before the tip, which thus appears bifid; inner dististyle a little longer, pale, with abundant setæ. Gonapophyses with the mesal branch very long and slender, gently sinuous, tapering to the acute tip. Ædeagus stout, subtended on either side at base by a long, extremely slender, gently curved rod that runs out to a needle-like point.

Hab. Japan (Kiushiu).

Holotype, ♂. Mt. Wakasugi, Chikuzen-no-kuni, altitude 2500 feet, April 19, 1921 (*H. Hori*).

Molophilus sericatus, sp. n.

Antennæ with the basal half light yellow; head and pronotum light yellow; mesonotum reddish fulvous; wings strongly tinged with yellow; vein *2nd A* relatively short; abdomen brownish yellow.

Female.—Length about 4 mm.; wing 4·5 mm.

Rostrum and palpi dark brown. Antennæ with the basal half light yellow, the terminal segments passing into brown; antennæ of moderate length, if bent backward extending nearly to the root of the halteres. Head light yellow.

Pronotum sulphur-yellow. Mesonotum light reddish fulvous, the lateral margin of the præscutum narrowly sulphur-yellow, the posterior sclerites of the notum obscure yellow. Pleura yellowish testaceous, slightly infuscated anteriorly. Halteres yellow, the knobs sericeous. Legs with the coxæ and trochanters yellow; remainder of legs infuscated, the basal three-fourths of the posterior femora obscure yellow; remainder of legs black. Wings strongly tinged with yellow, this including the short costal fringe; anal region of the wing a little darker; macrotrichiæ light brown; veins yellow. Venation: vein *2nd A* relatively short and straight, ending about opposite the fork of *Cu*.

Abdomen brownish yellow, the tergites a little darker. Ovipositor with the tergal valves only gently upcurved, the tips suddenly narrowed.

Hab. Japan (Hokkaido).

Holotype, ♂, Jozankei, Ishikari-no-kuni, altitude 1000 feet, August 16, 1923 (*T. Esaki*).

Molophilus sericatus bears a general resemblance to the Nearctic *M. pubipennis* (Osten-Sacken).

Ormosia horiana, sp. n.

Allied to *O. aculeata*, Alexander; general coloration grey, the præscutum with three brown stripes; antennæ of male elongate; wings greyish subhyaline, sparsely variegated with brown; veins R_2 and R_3 deflected strongly cephalad at tips; male hypopygium with the outer dististyle bearing at its base a flattened rectangular plate that terminates in two smooth spines.

Male.—Length 4·6–5 mm.; wing 5·5–6·8 mm.

Female.—Length about 4·5 mm.; wing 6 mm.

Rostrum and palpi black. Antennæ elongate, in the male if bent backward extending to beyond the base of the abdomen, black throughout, the flagellar segments elongate-cylindrical to fusiform. Head brownish grey.

Pronotum and mesonotum dark grey, the præscutum with three brown stripes, the centres of the scutal lobes likewise darkened; pseudo-sutural foveæ conspicuous, black. Pleura dark, grey-pruinose. Halteres pale, the knobs golden-yellow sericeous. Legs with the coxæ grey; trochanters brownish yellow; femora brown, covered with yellow setæ, the apex broadly blackened; in some specimens, and especially on the fore legs, there is a subbasal dark ring; tibiæ and tarsi black. Wings greyish subhyaline, the stigma brown; brown spots and seams arranged about as in *aculeata*, but smaller—at origin of *Rs*, on Sc_2, fork of *Rs*, and on basal deflection of Cu_1; longitudinal veins more or less seamed with brown. Venation: Sc_2 near mid-length of *Rs*; *r* at fork of R_{2+3}; tips of R_3, and especially R_2, deflected strongly cephalad; cell *1st* M_2 open by the atrophy of the outer deflection of M_3; *m* rectangular and spurred at its juncture with the free apical portion of M_3; basal deflection of Cu_1 variable in position, from one-half to nearly its length before the fork of *M*.

Abdomen dark brown, with sparse yellow setæ. Male hypopygium with the basistyle produced caudad into a slender needle-like point, as in *aculeata*; outer dististyle produced mesad into a long point, the apex of which is obtuse; at base of style bearing a quadrate flattened plate, the mesal outer angle of which is produced into a stout spine, the outer lateral angle into a long, smooth, gently curved spine. Gonapophyses straight, relatively slender, black, without a lateral tooth as in *aculeata*.

Hab. Japan (Kiushiu).

Holotype, ♂, Mt. Wakasugi, Chikuzen-no-kuni, altitude 2500 feet, April 19, 1921 (*H. Hori*).

Allotopotype, ♀.

Paratopotypes, 2 ♂ ♂.

This interesting crane-fly is named in honour of the collector, Prof. Hiroshi Hori. The species is most closely related to *O. aculeata* (Honshiu), from which it differs conspicuously in the elongate antennæ of the male and the structure of the hypopygium.

Gonomyia (*Gonomyia*) *gracilistylus*, sp. n.

Antennæ black; wings tinged with brownish grey; *Sc* short, Sc_1 ending far before the origin of the short arcuated sector; R_2 short; cell *1st* M_2 not pointed at proximal end; male hypopygium with three dististyles, the outermost long, slender, bisinuous.

Male.—Length about 3 mm.; wing about 3·8 mm.

Rostrum dark brown. Antennæ black throughout. Head grey.

Pronotum yellow. Mesonotal præscutum light brown, the humeral region and lateral margins whitish; scutal lobes greyish brown; scutellum obscure yellow; postnotum apparently dark-coloured. Pleura pale whitish, with a pale brown longitudinal mark on anepisternum and a less distinct one on the sternopleurite. Pleurotergite pruinose. Halteres pale, the knobs a little darkened. Legs with the coxæ yellow; trochanters testaceous; femora and tibiæ pale brown, the terminal tarsal segments passing into darker. Wings tinged with brownish grey, the stigma faintly darker; veins darker brown. Venation: *Sc* short, Sc_1 ending far before the origin of *Rs*, this distance greater than the length of the sector, Sc_2 a short distance from the tip of Sc_1; *Rs* strongly arcuated at origin; R_2 short, reaching costa less than its own length from the tip of R_1; R_{2+3} and R_3 subequal; cell *1st* M_2

not pointed at proximal end, the basal section of M_{1+2} fully equal to *m*; basal deflection of Cu_1 at fork of *M*.

Abdomen with the tergites dark brown, the sternites testaceous; hypopygium obscure yellow. Male hypopygium with the basistyles short and stout; three dististyles, the outermost long, slender, bisinuous; intermediate style a chitinized black rod, almost straight, near two-thirds its length narrowed into a spine, at its base with an appressed powerful seta; inner style fleshy, terminating in a powerful fasciculate seta, the outer or caudal margin with a comb of about five more delicate setæ from conspicuous punctures. Gonopophyses and ædeagus forming a large central mass.

Hab. Japan (Honshiu).

Holotype, ♂, Mt. Hakone, Sagami-no-kuni, altitude 2300 feet, July 13, 1928 (*T. Esaki*).

Limnophila (*Lasiomastix*) *breviramus*, sp. n.

General coloration reddish brown; abdomen dark brown; wings relatively narrow, uniformly tinged with brown, the macrotrichiæ long and conspicuous; *Rs* shorter than R_3; mesal branch of inner dististyle of male hypopygium very short.

Male.—Length about 6 mm.; wing 6.2 mm.

Rostrum and palpi dark brown. Antennæ of moderate length, if bent backward attaining the base of the abdomen; pale brown throughout, the flagellar segments with a short dense white pubescence. Head dark grey, the orbits and anterior vertex silvery grey.

Mesonotum reddish brown, unmarked, the scutellum and postnotum pruinose. Pleura reddish plumbeous. Halteres pale, the knobs a very little darker. Legs with the coxæ obscure yellow, the fore coxæ and base of mid-coxæ a little infuscated; trochanters obscure yellow; femora obscure yellow; tibiæ concolorous, the tips very narrowly infuscated; terminal tarsal segments passing into brown; legs hairy. Wings relatively long and narrow, with a uniform brown tinge, the small oval stigma a little darker brown; veins still darker brown. Macrotrichiæ of veins and cells very long and conspicuous, as in *L. macrotrichiata*, Alexander. Venation: *Rs* shorter than R_3 alone; *r* about twice its length from the tip of R_1; cell 1st M_2 elongate-rectangular, the basal deflection of Cu_1 near one-third its length.

Abdomen dark brown. Male hypopygium of the general type of the subgenus; inner dististyle with the posterior or mesal branch very short, not exceeding one-fourth the length of the flattened outer branch.

Hab. Japan (Honshiu).

Holotype, ♂, Yumoto, Shimotsuke-no-kuni, altitude 1830 feet, July 23, 1923 (*T. Esaki*).

Limnophila (*Ephelia*) *subaprilina yezoensis*, subsp. n.

Female.—Length 6·5 mm.; wing 6·1 mm.

Similar to typical *subaprilina*, Alexander, differing as follows:—

Antennæ with the scape pale brownish yellow, the basal segment of the flagellum conspicuously light yellow; flagellar segments 2 and 3 pale brown, the remainder of the organ dark brown. Legs with the femora scarcely tipped with darker.

Hab. Japan (Hokkaido).

Holotype, ♀, Jozankei, Ishikari-no-kuni, altitude 1000 feet, August 16, 1923 (*T. Esaki*).

Limnophila (*Dicranophragma*) *upsilon*, sp. n.

Female.—Length about 7·5 mm.; wing 7·4 mm.

Closely related to *L.* (*D.*) *formosa*, Alexander, from which it differs as follows:—

Size larger. Basal flagellar segments of antennæ longer, only the first distinctly yellowish. Mesonotal præscutum brown, sparsely pollinose, the extreme cephalic margin darkened; a conspicuous inverted U-shaped brown marking on either side, formed by the dark interspaces of the thoracic stripes, the lateral stripes being pointed in front. Pleura brown, indistinctly striped longitudinally with dark brown. Wings (of female) relatively narrow, widest opposite the cord; wing-pattern almost as in *formosa*, but with scattered brown dots in the interspaces, including cells *C*, *R*, *M*, *Cu*, *1st A*, *2nd A*, *1st* R_1, *1st* R_2, R_3, and R_5; the larger marginal spots are more circular in outline. Venation: Sc_1 conspicuously longer, exceeding cell *1st* M_2 in length; cell *1st* M_2 shorter and more nearly quadrate; *m* longer than the outer deflection of M_3, gently angulate; cell M_1 about equal to its petiole; basal deflection of Cu_1 shortly before mid-length of cell *1st* M_2.

Hab. Japan (Honshiu).

Holotype, ♀, Hinoëmata, Iwashiro-no-kuni, altitude 3280–6235 feet, July 24, 1923 (*T. Esaki*).

Limnophila subnemoralis, sp. n.

Close to the typical form of *L. nemoralis* (Meigen); basal segment of scape black; mesonotum pale reddish brown, dusted with grey, more heavily so on the pleura; wings tinged with pale yellow; abdomen pale brown, in the male with a conspicuous dark brown subterminal ring; hypopygium ochreous; gonapophyses clavate, their tips broadly rounded.

Male.—Length about 6·5 mm.; wing 7 mm.

Female.—Length 7·5 mm.; wing 7·2 mm.

Rostrum black. Antennæ with the basal segment of the scape black, the second segment dark reddish brown; flagellum brown. Head light grey, the anterior part of the vertex and the narrow orbits whitish.

Pronotum reddish brown, rather sparsely pruinose, the scutellum and postnotum more heavily so. Pleura reddish brown, whitish pruinose. Halteres light yellow. Legs with the coxæ and trochanters yellow, the fore coxæ and extreme base of mid-coxæ a little darker; remainder of legs obscure yellow, the terminal tarsal segments passing into dark brown. Wings tinged with pale yellow, the stigma only a little darker, almost bisected by r; veins pale yellowish brown. Venation: r about three times its length from the tip of R_1; R_{2+3} nearly three times the basal deflection of R_{1+5}; cell 1*st* M_2 rectangular, twice as long as wide; m almost straight, but longer than the outer deflection of M_3; cell M_1 about one-half its petiole; basal deflection of Cu_1 just beyond one-third the length of cell 1*st* M_2.

Abdomen pale brown; segments 7 and 8 dark brown, forming a conspicuous subterminal ring; hypopygium ochreous. Male hypopygium with the inner dististyle very broad at base. Gonapophyses clavate, the tips broadly rounded. In the female, the abdomen is uniformly rather dark brown.

Hab. Japan (Honshiu).

Holotype, ♂, Yumoto, Shimotsuke-no-kuni, altitude 4830 feet, July 23, 1923 (*T. Esaki*).

ESAKIOMYIA, gen. nov.

Antennæ elongate, much longer than the body, presumably 16-segmented in perfect specimens, only ten flagellar segments remaining in the type; flagellar segments beyond the first gradually decreasing in length, each with a basal enlargement followed by an almost equally dilated central portion, the apex narrowed, the base and central portion with long, conspicuous, outspreading verticils, the longest only a little shorter than the segment. Tibial spurs sinuous, a little less than the apical half smooth; tarsal claws small, smooth. Wings with conspicuous macrotrichiæ on all of the longitudinal veins. Venation: *Sc* moderately long, Sc_1 ending opposite the fork of *Rs*, Sc_2 shortly before its tip; *r* present but faint, five or six times its length from the tip of R_1; R_{2+3} elongate, about two-thirds *Rs*; inner end of cell R_3 lying slightly proximad of cells R_5 and 1*st* M_2; cell M_1 lacking; cell 1*st* M_2 elongate, widened distally; basal deflection of Cu_1 not far from the slightly pointed inner end of cell 1*st* M_2, opposite *r–m*; vein *2nd A* of moderate length, ending shortly before the origin of *Rs*; anterior arculus preserved. Male hypopygium of simple structure; basistyles stout, unarmed; dististyles two, the outer slender, chitinized, microscopically toothed at apex, the outer angle produced into a longer spine; inner style short and broad, pale. Ædeagus pale, triangular in outline; gonapophyses appearing as simple divergent rods.

Genotype, *Esakiomyia filicornis*, sp. n. (Eastern Palæarctic Region).

This tiny Hexatomine fly is named in honour of my friend, Professor Teiso Esaki. No immediate relatives can be indicated.

Esakiomyia filicornis, sp. n.

General coloration reddish brown; wings subhyaline, immaculate.

Male.—Length about 3 mm.; wing 4·2 mm.

Rostrum short, brown; palpi dark brown. Antennæ very elongate, black throughout, in uninjured specimens probably not less than one-half longer than the body. Head dark grey.

Mesonotum reddish brown, the præscutum with indications of a capillary brown median vitta. Pleura more infuscated. Halteres pale brown, the base of the stem brighter. Legs with the coxæ and trochanters reddish brown, the fore coxæ a little darkened at base; remainder of legs brown, the bases of the femora vaguely paler. Wings subhyaline, immaculate, the veins dark brown. Venation: as described under the generic characterization; *r* about three times its length beyond the fork of R_{2+3}; *m* a little shorter than the outer deflection of M_3.

Abdomen light brown, including the hypopygium.

Hab. Japan (Honshiu).

Holotype, ♂, Mt. Hakone, Sagami-no-kuni, altitude 2300 feet, July 12, 1923 (*T. Esaki*).

Ulomorpha nigricolor, sp. n.

General coloration shiny coal-black; halteres yellow; femora yellow, the tips conspicuously blackened; wings tinged with yellow, sparsely variegated with brown, including a narrow seam along the cord; distal half of wing with macrotrichiæ.

Male.—Length about 7·8 mm.; wing 7·2 mm.

Rostrum and palpi black. Antennæ of moderate length, if bent backward extending to beyond the wing-root, the scape black, the flagellum brown; segments beyond the base long-cylindrical. Head shiny coal-black.

Thorax entirely shiny coal-black. Halteres yellow. Legs with the coxæ coal-black, the apices of the middle and posterior coxæ reddish brown; trochanters reddish brown; femora yellow, hairy, the tips conspicuously blackened; tibiæ yellowish testaceous, the tips narrowly blackened; basitarsi yellowish testaceous, the tips and remainder of tarsi brown. Wings tinged with yellow, the base and cells *C* and *Sc* clearer yellow; a faint brown cloud at origin of *Rs*; a narrow brown seam extending from the stigma along the cord; outer end of cell 1*st* M_2 very indistinctly darkened; a brown cloud along vein *Cu*; veins brown. Conspicuous macrotrichiæ in all the cells beyond the cord and in the distal ends of cells *R*, *M*, *Cu*, and 1*st A*. Venation: Sc_1 ending a short distance before the long *Rs*, Sc_2 near its tip; *Rs* angulated and spurred at origin; *r* far from tip of R_1; R_{2+3} short, about equal to basal deflection of R_{4+5}; veins R_2 and R_3 strongly diverging, R_2 being parallel with R_1; inner ends of cells R_3, R_5, and 1*st* M_2 in alignment; cell M_1 lacking; basal deflection of Cu_1 about its own length beyond the fork of *M*.

Abdomen shiny coal-black, including the hypopygium. Male hypopygium with the basistyles stout basally, narrowed to the unarmed tips; outer dististyle chitinized, the apex suddenly narrowed into an acute spine; inner style simple, gradually narrowed beyond the base, setiferous. Gonapophyses appearing as complex chitinized structures, each with two spines that are directed mesad.

Hab. Japan (Honshiu).

Holotype, ♂, Lake Ozenuma, on boundary between

Iwashiro-no-kuni and Kotsuke-no-kuni, altitude 5460 feet, July 26, 1923 (*T. Esaki*).

The genus *Ulomorpha* had hitherto been recorded only from North America.

Eriocera subrectangularis, sp. n.

General coloration black, the mesonotal præscutum and scutum light grey pruinose; præscutum with three black stripes; femora dark brown, yellow basally; wings brownish grey with an extensive darker brown pattern; R_{2+3} subperpendicular at origin; cell M_1 lacking; cell 1*st* M_2 elongate; abdomen black, the segments light grey pruinose.

Male.—Length 8–10 mm.; wing 8·5–11 mm.

Female.—Length 14 mm.; wing 11·5 mm.

Rostrum and palpi black. Antennæ black, short in both sexes. Head black; vertical tubercle rather conspicuous, conical.

Pronotum black. Mesonotal præscutum light grey with three very conspicuous black stripes, the broad median stripe split by a capillary line, this becoming more distinct posteriorly; scutum light grey, the lobes with black centres; scutellum and postnotum black. Pleura dark brownish black, sparsely pruinose. Halteres light brown, the knobs darker. Legs with the coxæ and trochanters dark brownish black; femora yellow with about the apical half dark brown; remainder of the legs dark brownish black. Wings brownish grey, extensively but inconspicuously variegated with darker brown; a very large blotch at origin of *Rs*; cord and outer end of cell 1*st* M_2 broadly seamed with brown; veins dark brown. Venation: *Sc* long, Sc_1 ending far beyond origin of R_2; Sc_2 slightly beyond this origin; *Rs* long, arcuated at origin; R_{2+3} usually short, sometimes nearly as long as the deflection of R_{4+5}, in most specimens subperpendicular to the end of *Rs*, the latter being in alignment with R_{4+5}; *r* a little more than its own length from the tip of R_1 and at or beyond mid-length of R_2; deflection of R_{4+5} twice or more *r–m*; cell 1*st* M_2 very elongate, rectangular, nearly as long as vein M_{1+2} beyond it; cell M_1 lacking; basal deflection of Cu_1 just before mid-length of cell 1*st* M_2.

Abdomen black, the tergites with conspicuous latero-basal, light grey triangles, the median line black; sternites pruinose with light grey. Hypopygium black. Ovipositor with chitinized black valves.

Hab. Japan (Honshiu).

Holotype, ♂, Kofu, Kai-no-kuni, 1906 (*L. Drouart de Lezey*).

Allotopotype, ♀.

Paratopotypes, 1 ♂, 1 ♀.

Type in the collection of the Paris Museum.

Adelphomyia nipponensis, sp. n.

General coloration reddish brown; head grey; wings with a pale brown tinge, the stigma a little darker brown; cell M_1 present.

Female.—Length 3·5 mm.; wing 5·1 mm.

Rostrum and palpi black. Antennæ 16-segmented, black, the outer flagellar segments a very little paler. Head grey. Mesonotum and pleura almost uniformly reddish brown, the mesopleura weakly infuscated. Halteres testaceous. Legs with the coxæ and trochanters obscure yellow, the latter with lower faces infuscated; remainder of legs light brown. Wings with a pale brown tinge, the ill-defined stigma a little darker brown; veins brown. Sparse macrotrichiæ in the centres of the distal halves of cells *2nd* R_1, R_2, R_3, R_5, *2nd* M_2, M_3, all of cell M_1, and the distal ends of cells Cu and Cu_1. Venation: Sc_1 ending opposite the fork of Rs, Sc_2 near mid-length of the sector; r on R_2 about its own length beyond the fork of R_{2+3}; cell M_1 present, shorter than its petiole; basal deflection of Cu_1 near two-thirds its length beyond the fork of M.

Abdomen brown. Ovipositor with the apices of the upcurved valves yellow.

Hab. Japan (Honshiu).

Holotype, ♀, Yumoto, Shimotsuke-no-kuni, altitude 4832 feet, July 23, 1923 (*T. Esaki*).

The genus *Adelphomyia* is new to Japan.

Tricyphona seticauda, sp. n.

Closely related to *T. vetusta*, Alexander; legs black, the femoral bases narrowly obscure yellow; abdomen with the apical half, including the hypopygium, black; tergite and basistyles of male hypopygium with abundant conspicuous silvery setæ.

Male.—Length 10 mm.; wing 12·5 mm.

Rostrum dark, grey-pruinose; palpi dark brown. Antennæ with the scape black, the basal segment dusted with grey; flagellum broken. Head dark grey, the anterior part of vertex and orbits narrowly light grey; vertex culminating in a dark tubercle.

Pronotum blackish medially, pruinose laterally. Mesonotal præscutum brownish grey with a black median stripe that is split by a capillary vitta only a little paler than the stripes themselves ; lateral stripes dark brown ; scutum brownish grey, the lobes dark brown ; scutellum and postnotum dusted with grey. Pleura dark, light grey pruinose. Halteres obscure yellow, the knobs dark brown. Legs with the coxæ dark, light grey pruinose ; trochanters obscure brownish yellow ; remainder of the legs black, the femoral bases narrowly obscure yellow, brighter but no more extensive on the fore femora. Wings tinged with yellow, the base and cell Sc brighter ; conspicuous brown seams along the cord and outer end of cell *1st* M_2 ; brown spots at Sc_2, origin of Rs, and on the outer deflection of R_2 ; wing-tip and costal region narrowly seamed with brown ; veins dark brown. Venation : Rs strongly arcuated at origin ; outer deflection of R_2 about one and one-half times its length from the tip of R_{1+2} ; Rs in alignment with R_5 ; R_{2+3+4} not perpendicular to the end of Rs ; m on M_2 about its own length beyond the fork of M_{1+2} ; $m-cu$ at the fork of M.

Abdomen with the basal three tergites brown, the remainder gradually passing into black ; basal four sternites yellow, the fifth black with the caudal margin narrowly yellowish ; remainder of abdomen, including the hypopygium, black, the latter with abundant conspicuous silvery setæ on the tergite and apices of the basistyles. Dististyle conspicuous, with two subequal lobes, the outer densely set with short blackened pegs, the mesal lobe flattened, the margin rounded, the face set with a relatively few weak setæ.

Hab. Japan (Honshiu).

Holotype, ♂, Lake Ozenuma, on boundary between Iwashiro-no-kuni and Kotsuke-no-kuni, altitude 5400 feet, July 26, 1928 (*T. Esaki*).

HETERANGÆUS, gen. nov.

Characters as in *Polyangæus*, Doane, differing as follows : antennæ short, 12-segmented. Wings with a banded pattern. Venation : Rs long, spurred at origin ; a spur on R_{2+3} near its origin ; r lacking ; m present ; supernumerary cross-veins in cell R_3, R_4, M_1, and M, the latter approximately opposite the origin of Rs. Male hypopygium with the dististyle terminating in a single powerful erect spine.

Genotype, *Polyangæus gloriosus*, Alexander (Eastern Palæarctic Region).

Besides the genotype, the following species belong here :

H. esakii, sp. n., *H. japonicus* (Alexander), and *H. spectabilis*, sp. n. All of the known species are Japanese. In *Polyangæus*, *r* is present; *m* lacking; supernumerary cross-veins in cells R_3, R_4, and *M*, and the structure of the male hypopygium entirely distinct.

Heterangæus esakii, sp. n.

Mesonotal præscutum obscure yellow with three reddish-brown stripes; legs yellow, the segments tipped with black; wings tinged with brown, the costal cell entirely dark brown; a restricted darker pattern along the cord; cross-vein in cell R_3 lying distad of the one in cell R_4.

Male.—Length 10–10·5 mm.; wing 12 mm.

Rostrum and palpi black. Antennæ with the basal segment black, the second brown; flagellar segments obscure brownish yellow, the outer faces darker. Head brown, sparsely pruinose.

Mesonotal præscutum obscure yellow, with three reddish-brown stripes, the median stripe entire, not reaching the suture; remainder of mesonotum reddish testaceous. Pleura testaceous, the sternopleurite darker. Halteres yellow, the knobs more testaceous. Legs with the coxæ brownish yellow; trochanters obscure yellow; femora obscure brownish yellow, clearer at base, the tips broadly blackened; tibiæ yellow, the tips broadly blackened; basitarsi yellow, the tips and remainder of tarsi dark brown. Wings with a strong brown tinge, the costal cells entirely dark brown; cell *Sc* yellow, the base extensively dark brown; a brown seam at Sc_2; remaining pattern of the wing pale and restricted, the seams at origin of *Rs*, along the cord, and at the supernumerary cross-vein in cell *M* more ocelliform, yellowish, narrowly margined with dusky; a pale brown clouding follows the centre of cell *R* for its entire length to the cord; brown washes in the stigmal region, along R_2, and on the supernumerary cross-veins beyond the cord; conspicuous brown washes along the caudal margin, one extending from cell Cu_1 to *1st A*, the second at the end of vein *2nd A* in both cells; a series of small, diffuse, brown dots in cell *Cu*; veins dark brown. Venation: Sc_2 far before the origin of *Rs*; short spurs at origin of *Rs* and on R_{2+3} near origin; R_2 about twice its length from the tip of R_{1+2}; supernumerary cross-vein in cell R_3 nearly twice its length beyond the one in cell R_4; cross-vein in cell M_1 beyond mid-length of the long cell; *m* oblique, weakly sinuous, about its length beyond the fork of M_{1+2}; basal deflection of Cu_1 about one-half its length beyond the fork of *M*; supernumerary cross-vein in cell *M* sinuous, its proximal end about opposite the origin of *Rs*.

Abdomen dark brown throughout, including the hypopygium. Male hypopygium with the spines at apex of basistyle abundant, slender.

Hab. Japan (Honshiu).

Holotype, ♂, Lake Ozenuma, on boundary between Iwashiro-no-kuni and Kotsuke-no-kuni, altitude 5160 feet, July 28, 1923 (*T. Esaki*).

Paratopotype, ♂.

This interesting crane-fly is named in honour of the collector, Professor Teiso Esaki, to whom I am very greatly indebted for unrivalled series of Japanese Tipulidæ.

Heterangæus spectabilis, sp. n.

General coloration yellowish testaceous; legs black, the femoral bases yellowish; wings whitish subhyaline, cross-banded with brown; cells *C* and *Sc* uniformly dark brown; supernumerary cross-veins in cells R_3 and R_4 in alignment.

Female.—Length about 11 mm.; wing 10·5 mm.

Rostrum and palpi black. Antennæ with the scape black, the flagellum conspicuously light yellow, the segments with long verticils. Head dark grey.

Pronotum dark brown in front, the posterior half obscure yellow. Mesonotum and pleura yellowish testaceous, without distinct markings. Halteres yellow, the knobs conspicuously dark brown. Legs with the coxæ and trochanters light yellow; remainder of legs brownish black, only the extreme bases of the femora yellowish. Wings whitish subhyaline, with a conspicuous brown pattern; cells *C* and *Sc* dark brown, only the caudal margin of the latter above the sector paler; prearcular region and extreme bases of cells *R* and *M* brown; a circular area at origin of *Rs*, in alignment and practically confluent with the broad seam along the supernumerary cross-vein in cell *M*; a band along the cord, broadest on the anterior cord; conspicuous seams on R_2, the supernumerary cross-veins in cell R_3, R_4, M_1, and on *m*, together with seams on the longitudinal veins back from the margin, the whole forming a reticulate pattern; space behind vein *Cu* infuscated, except at base, on Cu_2 widening out to form a large area in the distal end of cells Cu_1, *Cu*, and *1st A*; a similar area at the end of vein *2nd A* in cells *1st A* and *2nd A*; other blotches in basal third of cell *Cu* behind the atrophied branch and in cell *2nd A* near mid-length; most of the cross-bands have paler centres than the broad darker margins; veins brown, paler in the clear

areas. Venation: Sc_2 some distance before the origin of Rs; R_2 less than its length from the tip of R_{1+2}; supernumerary cross-veins in cells R_3 and R_4 near the outer ends of cells and in alignment; supernumerary cross-vein in cell M_1 just beyond the mid-length of the cell and slightly distad of the cross-veins in cells R_4 and R_5; m at fork of M_{1+2}; supernumerary cross-vein in cell M opposite the origin of Rs.

Abdominal tergites brown, the sternites more yellowish, the terminal segments passing into brown. Ovipositor with the powerful tergal valves compressed, gently upcurved.

Hab. Japan (Honshiu).

Holotype, ♀, Hinoëmata, Iwashiro-no-kuni, altitude about 4000 feet, July 24, 1923 (*T. Esaki*).

VII.—*Description d'une espèce nouvelle de* Coccinellide.
Par le Dr. Sicard.

Cleothera bromelicola, sp. n.

♂. Rotundata, convexa, supra glabra, nitida, subtilissime punctata, nigra; capite, prothoracis lateribus margineque antico, maculis elytrorum tribus pedibusque flavis; abdomine brunneo lateribus dilutiore.

Long. 3 mm.

Arrondie, convexe, glabre en dessus, d'un noir luisant avec la tête, les côtés et le bord antérieur du corselet, trois taches sur les élytres et les pieds d'un jaune pâle. Abdomen d'un roux brunâtre, plus clair sur les bords.

Tête flave, ainsi que le labre, avec les mandibules rembrunies à l'extrémité. Palpes et antennes de même couleur que la tête. Yeux verts, recouverts à leur partie postérieure par le bord antérieur du corselet. Celui-ci noir avec une large tache latérale flave étendue sur le quart externe de la base, anguleuse à son bord interne et réunie à une bordure antérieure assez large, émettant à sa partie moyenne une courte bande antéro-postérieure qui n'atteint pas la base. On peut aussi considérer le prothorax comme étant de couleur jaune pâle avec une tache discoïdale noire couvrant la moitié de la base, obliquement et faiblement rétrécie en avant et en dedans et terminée à sa partie antérieure par deux courtes et larges bandes presque contiguës. Côtés du prothorax presque droits, base en arc de cercle large, non sinuée ; ponctuation très fine et assez dense. Ecusson noir, en triangle un peu plus long que large.

Elytres droits à la base, à angle huméral bien net, à calus saillant, arrondi sur les côtés, tronqués postérieurement, laissant à découvert le pygidium ; ponctuation dense, fine et assez profonde, un peu plus grosse que celle du corselet ; noirs avec trois taches flaves : 1 couvrant les trois cinquièmes internes de la base, entourant l'écusson, coupée obliquement en dehors et en arrière à partir de l'extrémité de celui-ci ; la partie externe sinuée et oblique en dedans et en arrière, formant ainsi un dessin triangulaire dont la pointe postérieure atteint le cinquième de la longueur totale de l'élytre ; l'ensemble des deux taches représente assez bien les contours de deux ailes de papillon ; tache 2 triangulaire, à l'angle huméral ; tache 3 en forme de lunule parallèle au bord externe jusqu'à l'apex qui reste étroitement noir. Epipleures flaves avec le bord externe étroitement noir au milieu. Dessous noir avec les épimères (sauf celles du métasternum) d'un jaune flave. Métasternum à ponctuation dense et grosse. Abdomen brunâtre, plus clair sur les bords et à l'extrémité, les arceaux portant quelques poils jaunâtres courts. Pieds flaves.

Les individus examinés sont des ♂. Il est probable que la ♀ a la tête noire, la bordure antérieure du prothorax étroite et non prolongée en arrière en son milieu, et la tache de l'angle huméral des élytres petite ou absente.

Cette espèce est très voisine des *C. albopunctata*, Crotch, du Brésil, et *panamensis*, Gorh., de l'Amérique centrale. Chez la première, la tache 1 petite et arrondie est située sur le disque et non à la base de l'élytre près de l'écusson. La seconde présente seulement une bordure apicale, plus étroite que chez *bromelicola* (où elle couvre à sa partie antérieure plus du quart de la largeur de l'élytre), sans tache discale ; la tache noire du corselet n'est pas échancrée en avant.

PANAMA : Canal Zone, vii. 1924 (*D. T. Fullaway*).

Les larves vivent aux dépens du *Pseudococcus bromeliæ*.

VIII.—*Notes on the Silurian Brachiopod Genera* Delthyris, Uncinulina, *and* Meristina. By Helen M. Muir-Wood, M.Sc., F.G.S.

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SUMMARY.

In this paper the different interpretations of the genus *Delthyris* are discussed, and that given by Schuchert in 1913 is adopted with slight amendment. The species *Delthyris elevata*, *D. crispa*, *D. elegans* (nom. nov. for *D. crispa*, Hisinger, non Linnæus), and *D. tenuilamellata*, sp. n., from the British Silurian, are all described and figured.

The distinguishing characters of the genera *Uncinulus* and *Uncinulina* are pointed out, and *Uncinulina* is retained with *U. fallaciosa* as genotype. *Rhynchonella stricklandi* and *Terebratula lewisi* are transferred to the genus *Uncinulina*. *Meristina tumida* (Dalman) is shown to be a synonym of *Meristina obtusa* (Sowerby).

The British Silurian Spirifers can be separated into two groups:—(1) those with longitudinal folds and a transverse ornament of imbricating lamellæ (=*Delthyris* of Dalman) and (2) those with longitudinal folds bearing fine continuous longitudinal striæ (=*Eospirifer* of Schuchert).

The species referable to both these genera have as a rule been assigned to the genus *Spirifer*, from which, however, they differ in internal characters.

DELTHYRIS, Dalman, 1828.

Genolectotype: *D. elevata*. (See Schuchert *.)

The genus *Delthyris* was first described by Dalman in 1828 † to include the species *D. elevata*, *cyrtæna*, *crispa*, *subsulcata*, *ptychodes*, and *cardiospermiformis*. Of these species *Delthyris cyrtana* is *Eospirifer plicatellus* (Linnæus) and *D. cardiospermiformis* is *Bilobites biloba* (Linnæus); nor is *D. ptychodes* a Spirifer. The original description, therefore, included a variety of generic forms, and the generic characters other than those of shape and external ornament were not very precisely defined. This at once caused confusion, for Menke in 1830 ‡, although quoting *Delthyris*,

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* Bull. U.S. Geol. Surv. lxxxvii. p. 206 (1897).

† Kongl. Svenska Vet.-Akad. Handl. for 1827, p. 93.

‡ 'Synopsis methodica Molluscorum,' ed. ii. p. 96.

Dalman, as including *Spirifer* of Sowerby and *Trigonotreta* of Koenig, yet gives as species of *Delthyris*, *Anomia dorsata* and *Terebratula spatula*, of which *Anomia dorsata* belongs to the genus *Terebratella* and *Terebratula spatula* to *Terebratulina*. Von Buch in 1836* included in *Delthyris* species of *Spirifer* and *Orthis*, which had a triangular foramen.

Among other authors Dall † quoted *Delthyris* as a synonym of *Spirifer*, and it was not until Hall ‡ published his great work on the Brachiopoda in 1894 that the distinctive characters of *Delthyris* were recognized. Of Hall's subdivisions of the genus *Spirifer* the group of Fimbriati Unicispinei is taken to be equivalent to *Delthyris*, s. s. Hall states also that the distinguishing character of this group lies in the ornament of the concentric fimbriæ—namely, short simple spines,—and that it includes the species *Delthyris crispa* and *D. elevata*. The group is said not to extend above the Devonian. On another page of the same work Hall shows how *Reticularia* differs from *Delthyris* in its fimbriæ, which have large spines with lateral branches. *Spirifer sulcatus*, Hisinger, is placed in the Lamellosi Septati, a group which has concentric lamellæ covered with fine radiating striæ, but with no spines, is not punctate, and does not have the primary lamellæ of the spiral arms united as in the Spiriferinas. A probable passage of the Septati into the punctate genus *Spiriferina* is suggested. Both these groups are said to have a median septum in the pedicle-valve. From Hall's description it would appear that there are three groups of impunctate lamellose Spirifers, distinguished only by the character of the ornament of the concentric lamellæ, which in the case of *Delthyris* is said to be composed of short spines.

A more precise and very different interpretation of the genus *Delthyris* was given by Schuchert in 1913 §. In 1897 ‖ he selected the species *Delthyris elevata* as the genotype of *Delthyris*, stating that all specimens examined by him possessed a median septum in the pedicle-valve. *Delthyris sulcata*, Hisinger, was also quoted as a true *Delthyris*, but *D. crispa*; Hisinger, was placed in the genus *Spirifer*.

Schuchert describes *Delthyris* as a subgenus of *Spirifer*, consisting of "small early *Spirifers* that are coarsely plicate, except on fold and sinus. Surface lamellose, the imbricating lamellæ marked with very fine radiating striæ, which do not terminate in spines. Short dental lamellæ present along with a more or less high ventral median septum. Resembles *Spiriferina*, but the shell structure is not finely and regularly punctate. Section Lamellosi-Septati Hall & Clarke." The description of the ornament of the lamellæ given by Schuchert will be seen to be exactly the reverse of that given by Hall. H. S. Williams*, in a discussion on *Delthyris elevata* and allied species, quotes the absence of a median septum in specimens having a groove along the median fold of the brachial valve. He describes two species, *Spirifer trescotti* and *Spirifer cobscooki* from the Silurian of Maine, both similar externally to *Spirifer elevatus* of Dalman, but *Spirifer trescotti* like *S. elevatus* has a median septum developed in the pedicle-valve, while *S. cobscooki* has none.

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* "Ueber *Delthyris* oder *Spirifer* und *Orthis*," Abh. K. Akad. Wiss. Berlin, p. 11.

† Bull. U.S. Nat. Mus. viii. p. 25 (1877).

‡ 'Palæontology of New York,' vol. viii. pt. 2, pp. 9 & 10.

§ Zittel-Eastman, 'Text-book of Palæontology,' p. 411.

‖ Bull. U.S. Geol. Surv. lxxxvii. pp. 206 & 386 (1897).

The development, however, of a median septum in the pedicle-valve does not appear to be constant, even for one species. Investigation of the species *D. crispa*, Linnæus, and *D. elegans*, nom. nov. = *D. crispa*, Hisinger (non Linnæus), showed that the median septum was usually absent, but occurred in an incipient state of development in one or two specimens of *D. elegans*. The contention that there is no median septum in forms which have a median groove along the central fold of the brachial valve does not appear to hold in the case of *Delthyris elevata*, which certainly has a median septum in those individuals whose brachial valves possess a grooved fold. The presence of a median septum in the pedicle-valve does not appear to be of great generic importance in the Silurian species of *Delthyris*, although, according to American authors, it appears to be a more constant feature in Devonian species.

While the lamellæ of *Delthyris elevata*, *crispa*, *elegans*, and *tenuilamellata* are ornamented with granules or longitudinal striæ, those of *Reticularia* and well-preserved specimens of *Spiriferina* have a true spinose ornament. *Spiriferina*, however, usually has smooth lamellæ, which are abundantly punctate. The genus *Tylothyris*, North †, from the Lower Carboniferous limestone, is distinguished by that author from *Delthyris* by its greater size, by its smaller and more numerous costæ, and by the marked development of an apical callosity. Its shell, like that of *Delthyris*, is impunctate, but there is apparently no ornament on the lamellæ. It is possible that some of the species from the Upper Devonian and Lower Carboniferous that have been assigned to the genus *Delthyris* should be more correctly placed in the genus *Tylothyris*. In a group of impunctate lamellose Spirifers which Weller* describes from the Carboniferous beds of Illinois a median septum is present in the pedicle-valve, but the lamellæ in one of the species are said to be fimbriate, while in the remaining species, apparently, the lamellæ are not ornamented. It is doubtful, therefore, whether these species belong to *Delthyris* or whether they should be placed in *Tylothyris*.

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* Proc. U.S. Nat. Mus. Washington, vol. li. p. 75 (1917).

† North, Quart. Journ. Geol. Soc. vol. lxxvi. p. 195 (1920).

A modification of the internal structure of the pedicle-valve is described by Dunbar† in his species *Delthyris cyrtinoides* from the Devonian. The dental plates converge and unite with the median septum, which is continued posteriorly into the cavity formed by union of the dental plates—an example of parallelism with the corresponding structure in *Cyrtina*.

There appears to be no reason for the generic separation of *Delthyris crispa*, Hisinger (non Linnæus), here renamed *D. elegans*, from the species *D. elevata* and *D. sulcata*, though the last two species were described by Schuchert as true *Delthyris*, while he included *D. crispa*, Hisinger, in *Spirifer*.

Additional generic characters in *Delthyris* are afforded by the spirals, which consist of seven coils and have their apices directed towards the cardinal angles.

Delthyris elevata, Dalman‡. (Figs. 7, 8, 8 *a*.)

Genotype of *Delthyris*, sec Schuchert (Bull. U.S. Geol. Survey, lxxxvii. (1897), p. 206).

Description.—Width approximately equal to the length, with the widest part of the shell occurring at a point slightly below the hinge. Both valves highly convex. Apical angle 100°. Cardinal angles rounded. Area of pedicle-valve high, its length considerably shorter than that of the hinge. Delthyrium large and open, bordered by linear deltidial plates. Umbo rounded, much incurved. Ornament in the pedicle-valve consists of five rounded costæ on each side of the sinus, while in the brachial valve there are five costæ on each side of the broad median fold which is frequently longitudinally grooved. The width of the sulci separating the costæ is approximately half that of the costæ. Crossing the costæ there are very numerous concentric growth-lamellæ, along each of which are set numerous slightly elongated granules, the interspaces between the granules being less wide than the width of each granule.

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* Illinois Geol. Surv. Mon. i., Text. Mississippian Brachiopoda, p. 300 (1914).

† Trans. Connecticut Acad. xxiii. p. 138 (1920).

‡ Dalman, 1828, Vet.-Akad. Handl. p. 120, pl. iii. fig. 3.

Interior of the pedicle-valve with median septum developed.

Average Dimensions.—Length 18 mm.; width 21 mm.; thickness 16 mm., or 1 : 1·1 : ·8.

Type-specimen.—The specimen figured and described by Dalman from Gothland is hereby selected as the holotype.

Horizons.—Upper Llandovery–Upper Ludlow Beds.

Delthyris crispa (Linnæus). (Figs. 1, 2, 2 *a*.)

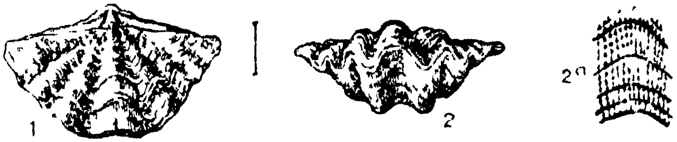
1758. *Anomia crispa*, Linnæus, Systema Naturæ, 10th edition, vol. i. p. 702.
1828. *Delthyris sulcata*, Hisinger, Anteckningar i Physik och Geognosi, vol. iv. pp. 228, 238.
1831. *Delthyris sulcata*, Hisinger, Anteckningar, vol. v. pp. 119, 140, pl. iii. fig. 2.
1837. *Delthyris sulcata*, Hisinger, Lethæa Svecica, Holmiæ, p. 73, pl. xxi. figs. 6 *a–c*.
1848. *Spirifer sulcatus*, T. Davidson, Bull. Soc. Géol. France, 2nd ser. vol. v. pl. iii. fig. 41, p. 325.
1860. *Spirifer sulcatus*, Lindstrom, Öfv. k. Vet.-Akad. Forhand. xvii. no. 8, p. 369.
1866. *Spirifera sulcata*, T. Davidson, Mon. Brit. Foss. Brach. vol. iii. part i. pl. x. figs. 4, 5, 12, p. 91.
1882. *Spirifera crispa*, T. Davidson, Mon. Brit. Foss. Brach., Suppl. vol. v. pl. iv. figs. 9, 10.

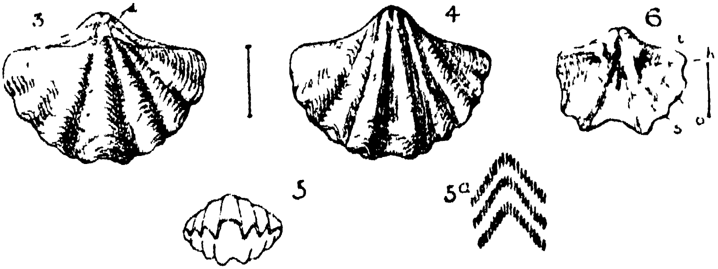
Description.—Laterally elongated, with the hinge-line forming the widest part of the shell. Pedicle-valve more convex than the brachial valve. Apical angle 134°. Cardinal extremities angular. Pedicle-valve with concave area extending along whole length of hinge. Delthyrium open, with linear deltidial plates. Umbo acute, slightly incurved.

In the pedicle-valve there are three rounded longitudinal costæ on each side of the median sinus, while in the brachial valve there are six costæ in addition to the broad median fold. Crossing the costæ there are from 10–15 prominent imbricating lamellæ less than 0·75 mm. apart. The microscopic ornament consists of small granulations arranged in rows along fine longitudinal striæ; the granulations are also seen to form less regular concentric rows. The ornament is interrupted by the transverse lamellæ. Interior of pedicle-valve usually without a median septum.

Average Dimensions.—Length 7 mm.; width 11 mm.; thickness 4·5 mm., or 1 : 1·5 : ·6.

Type-specimen.—The specimen figured in Museum Tessinianum, 1753, tab. v. fig. 7, and referred to by Linnæus in





Figs. 1, 2, 2 *a* *Delthyris crispa* (Linnæus) from the Wenlock Limestone, Dudley. British Museum Geol. Dept. B 44,916 1. Brachial valve showing ornament (× 2½). 2. Anterior view showing angular cardinal extremities (× 2½). 2 *a*. Ornament under microscope (× 10)

Figs 3, 4, 5, 5 *a*, 6. *Delthyris elegans*, nom. nov., from Wenlock Limestone, Dudley British Museum Geol. Dept. B. 44,917. 3. Brachial valve showing ornament, *d* = linear deltidial plates (× 2). 4. Pedicle-valve (× 2) 5 Anterior view showing rounded cardinal extremities (nat. size). 5 *a*. Ornament under microscope (× 10). 6. Interior of pedicle-valve showing low median septum (from Wenlock Limestone, Dudley. British Museum Geol Dept. B. 44,919); median septum (*s*), hinge-teeth (*t*), dental plates (*h*), and ovarian markings (*o*) (× 2).

'Systema Naturæ' in 1758, is hereby selected as holotype. No horizon or locality is given in the description.

Horizon.—Wenlock Limestone and Shale.

Delthyris crispa was described by Linnæus as *Anomia crispa* in 'Systema Naturæ' in 1758. A brief description is given, and reference is made to Museum Tessinianum, 1753, where Linnæus described and figured this species as *Concha Anomia dilatata.*

The specimen figured is a laterally elongated form, having the greatest width along the hinge-line, with angular cardinal extremities, a broad median fold in the brachial valve and a corresponding sinus in the ventral valve. On either side of the fold and sinus are three rounded costæ. A transverse ornament of imbricating lamellæ is well shown, the lamellæ being separated by an interspace of about 0·75 mm. This figure was reproduced by Davidson in 1866 (fig. 12), but the ornament was not clearly shown.

Hisinger in 1826[*] figured without description *Terebratula* (*Anomia,* L.) *crispa* from the crinoidal limestone of Gothland. This species, unlike Linnæus' species, had rounded cardinal angles, and the greatest width of the shell occurred at a point below the hinge. The transverse lamellæ were not shown at all in the figure. A similar figure was given in 1828[†] by Dalman, who described it as *Delthyris crispa* of Hisinger. In the same year Hisinger[‡] figured the same form, but ascribed the species to Dalman, stating in the same publication[§] three years later that the description given by Linnæus of *Anomia crispa* agreed with one given by himself of *Delthyris sulcata*, but that, since Dalman[‖], under the name of *crispa,* had described a different shell, which lacked the median rib, he was obliged to give the form which he was describing the new name of *sulcata.* He gives a good representation of *Delthyris crispa* of Linnæus in the same work. *Anomia crispa* of Linnæus is again quoted as a synonym of *Delthyris sulcata* by Hisinger in 1837[¶]. In spite of these statements by Hisinger, and that made by Lindström in 1860[**], about the similarity of *Anomia crispa* of Linnæus to *Delthyris sulcata* of Hisinger, the specific names *sulcata* and *crispa* of Hisinger have remained in general use to the present day. According to the rules of zoological nomenclature, therefore, *Delthyris*

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[*] Vet.-Akad. Handl. tab. vii. fig. 4, p. 336 (1826).

[†] Vet.-Akad. Handl. p. 222, tab. iii. fig. 6 (1828).

[‡] 'Anteckningar i Physik och Geognosi,' vol. iv. tab. vii. fig. 4 (1828).

[§] Hisinger, *l. c.* vol. v. p. 119 (1831).

[‖] As a matter of fact, Hisinger himself had already figured it (Vet.-Akad. Handl. tab. vii. fig. 4, 1826).

[¶] 'Lethæa Svecica,' Holmiæ, pl. xxi. figs. 6 *a–c*, p. 73 (1837).

[**] "Bidrag till kännedomen om Gothlands Brachiopoder," Öfv. K. Vet.-Akad. Forhand. Stockholm, p. 359 (1860).

crispa (Linnæus) must be used for *Delthyris sulcata*, Hisinger; *Delthyris elegans*, nom. nov., may be used for *Delthyris crispa* (Hisinger).

Delthyris elegans, nom. nov. (Figs. 3, 4, 5, 5 *a*, 6.)

1826. *Terebratula crispa*, Hisinger. Vet.-Akad Handl. tab. vii fig 4, p 336.
1828. *Delthyris crispa*, Dalman, Vet.-Akad. Handl. for 1827, tab. iii. fig 6, p 222
1828. *Delthyris crispa*, Hisinger, 'Anteckningar,' vol. iv tab. vii. fig 4, pp 220, 238
1836. *Spirifer crispus* (in part), Von Buch, "Ueber *Delthyris* oder *Spirifer* und *Orthis*," Abh. K. Akad. Wiss Berlin, p 40
1837. *Delthyris crispa*, Hisinger, 'Lethæa Svecica,' p. 73.
1839. *Spirifer crispus*?, J. de C. Sowerby in 'The Silurian System,' pt. ii pl. xii. fig 8, p 624.
1848. *Spirifer crispus*, Davidson, Bull. Soc. Géol. France, 2nd ser. vol. v pl. iii fig. 42, p. 325.
1866. *Spirifer crispa*, Davidson, Mon. Brit Foss. Brach. vol. iii pt vii. no 1, pl. x. figs. 13, 14, 15, p. 97.

Description.—Wider than long, with the widest part of the shell occurring at a point slightly below the hinge. Brachial valve less convex than pedicle-valve. Apical angle 110°. Cardinal angles rounded. Area of pedicle-valve concave, extending only for two-thirds of the length of the hinge. Delthyrium open, bordered by linear deltidial plates. Umbo acute, incurved. Ornament in the pedicle-valve consists of four rounded longitudinal costæ on the lateral slopes on each side of the sinus, while in the brachial valve there are six costæ in addition to the median fold. The sulci separating the costæ are approximately equal in width to the costæ. Crossing these there are about thirty concentric lamellæ forming a regular transverse ornament. Under the microscope the lamellæ are seen to be striated longitudinally with fine somewhat irregular lines not passing from one lamella to the next, the interspaces being approximately equal in width to that occupied by the striæ.

Interior of pedicle-valve with small teeth supported by short dental plates, outside which are numerous rounded pits representing ovarian markings. A low median septum may be developed, but in many of the specimens examined was not present.

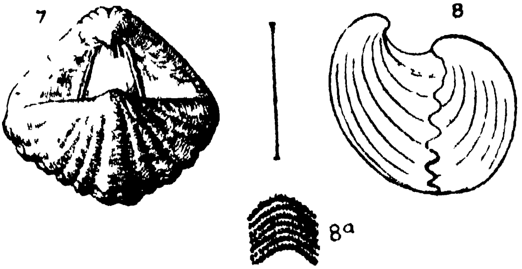
Average Dimensions.—Length 10 mm.; width 13 mm.; thickness 8 mm., or 1 : 1·3 : ·8.

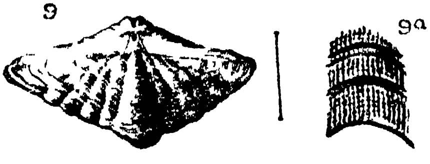
Type-specimen.—The specimen figured by Hisinger from the "Encrinit-kalksten of Djupviken," Gothland, is hereby selected as the holotype.

Horizon.—Upper Llandovery Beds. Wenlock Limestone and Shale and Aymestry Limestone.

Delthyris tenuilamellata, sp. n. (Figs 9, 9 *a*.)

Description.—Outline transversely rhomboidal, with width of the shell approximately equal to twice the length. Valves equally convex. Apical angle 136°. Cardinal extremities angular. Pedicle-valve with a low area, whose length is slightly less than that of the hinge. Deltidial plates conjunct, foramen oval. In the pedicle-valve there are four costæ on each lateral slope, and there are eight costæ in addition to the median fold in the brachial valve. Growth-lamellæ are fairly numerous and very closely placed anteriorly. The ornament tends to become obsolete near the cardinal extremities. The microscopic ornament consists





Figs 7, 8, 8 *a*. *Delthyris elevata*, Dalman, from the Wenlock Limestone, Dudley British Museum Geol. Dept. B 41,918 7. Shows ornament of the brachial valve and high area, open delthyrium, and linear deltidial plates of the pedicle-valve (× 1½). 8. Lateral view showing convexity of valves and area of pedicle-valve (× 1½). 8 *a*. Ornament under microscope (× 10).

Figs. 9, 9 *a*. *Delthyris tenuilamellata*, sp n., from the Wenlock Shale, Buildwas, Shropshire British Museum Geol. Dept. B. 44,915. 9 Shows ornament of the brachial valve, area, and conjunct deltidial plates of pedicle-valve (× 1½). 9 *a*. Ornament under microscope (× 10).

of fine longitudinal striæ, along which are set very small granules. These are also arranged in regular concentric rows, giving the appearance of reticulation. No median septum in the pedicle-valve was developed in any of the specimens examined.

Dimensions.—Length 10·5 mm.; width 21 mm.; thickness 8·5 mm., or 1 : 2 : ·8.

Holotype from Wenlock Shale, Buildwas, Shropshire, preserved in the British Museum (Natural History), Walker Collection (B. 14,915).

Horizon.—Wenlock Shale and Limestone.

UNCINULINA and UNCINULUS, Bayle, 1878.
(Figs. 10, 11.)

The genera *Uncinulina* and *Uncinulus* were figured by Bayle in 1878, but no description accompanied the plates. *Uncinulina fallaciosa*[*], Bayle, was figured as the only species of this genus, but *Uncinulus* is represented by three species, namely, *Hemithyris subwilsoni*, d'Orbigny, *Uncinulus oehlerti*, and *U. imperator*[†]. All these species are of Devonian age. No internal characters were shown of *Uncinulina*, but those of *Uncinulus subwilsoni* were well depicted. It remained for Oehlert in 1884[‡] to describe and figure these genera in greater detail, the species *H. subwilsoni* was chosen by him as the genolectotype of *Uncinulus*. Oehlert considered that the genus *Uncinulina* was indistinguishable from *Rhynchonella*, and accordingly he placed the species *U. fallaciosa* in that genus.

Uncinulina fallaciosa, as figured by Bayle and Oehlert and described by the latter author, has a sub-cuboidal outline with a rather flat pedicle-valve having a shallow median sinus. Each valve is ornamented with 20–24 simple prominent costæ. The umbo is short and incurved till it rests on the brachial valve, and the umbonal slopes are flattened and smooth. In the interior of the ventral valve the diductor muscle-scars are large and flabelliform, and enclose two small oval adductors. The brachial valve is strongly convex with a slightly raised median fold ornamented with six costæ. Internally the hinge-plate is divided into two parts by a narrow oval incision, and there is no cardinal process. The hinge-plate is apparently supported by a median septum, but this is not well represented.

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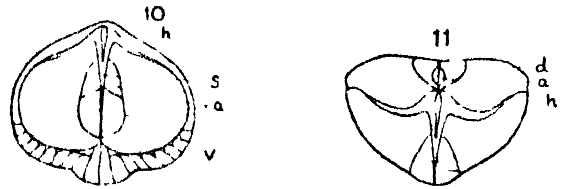
[*] Explic. de la Carte Géol. de France, vol. iv. pl. xiii. figs. 13–16.

[†] Explic. de la Carte Géol. de France, vol. iv. pl. xi. figs. 11–16.

[‡] Bull. Soc. Géol. France, 3rd ser. vol. xii. pp. 420, 422.

The distinguishing characters of *Uncinulus*, as determined from *U. subwilsoni*, are its spherical contour and external ornament of fine flattened costæ longitudinally grooved near the anterior margin of each valve. In the interior of the pedicle-valve the muscle-scars are surrounded by a narrow ridge; while in the brachial valve there is a solid undivided hinge-plate, in the centre of which is a broad cardinal process longitudinally notched at the summit. Short crura extend downwards from the hinge-plate, and a median septum separates the two pairs of adductor muscle-scars.

The main points of difference, therefore, between *Uncinulina* and *Uncinulus* are in the contour, costation, and in the tongue of the ventral valve which is truncate in *Uncinulus* and has a straight line of contact with the brachial valve, while in *Uncinulina* it is notched owing to the alternation of the costæ of the two valves. Internally the position of the muscle-scars is different in each valve, and in *Uncinulina* the hinge-plate is divided and no true cardinal process is developed.



Figs. 10, 11. *Uncinulina stricklandi*, J. de C. Sowerby, from the Wenlock Limestone, Much Wenlock, Shropshire. British Museum (Geol. Dept. B 44,920. Nat. size. 10. Diagrammatic drawing of the brachial valve from an internal cast, showing (*s*) median septum, (*h*) hinge-plate, (*a*) adductor muscle-scars, (*v*) vascular markings. 11. Posterior view showing (*a*) adductor, (*d*) diductor muscle-scars of pedicle-valve, (*h*) hinge-plate of brachial valve.

J. Hall in 1894* suggested that the name *Uncinulina* should be retained for forms such as *Rhynchonella stricklandi*, in which the hinge-plate is divided anteriorly, but is united towards the apex, and in which the form is sub-cuboidal and less globose than *R. wilsoni*. In the same year, however, he gave *Uncinulina* as a synonym of *Uncinulus* †, while R. S. Bassler in 1915 ‡ quoted *Uncinulina* as a synonym of

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* Pal. of New York, vol. viii. pt. 2, p. 190.

† J. Hall and J. M. Clarke, 11th Ann. Rep. State Geologist, p. 828 (1894).

‡ Bull. U.S. Nat. Mus. xcii. vol. ii. p. 1334.

Wilsonia. Cowper Reed, in 1922[*], refers several species from the Devonian of Chitral and the Pamirs to *Uncinulina*, making this a subgenus of *Uncinulus*. He bases his determinations on external rather than on internal characters, and does not mention the hinge-plate in any of his descriptions, but states that the muscle-scars of the brachial valve resemble very closely those of *Uncinulina*, and points out the distinctions between that genus and *Hypothyridina*, S. Buckman = *Hypothyris*, auctt.

It is proposed, therefore, to use the generic name of *Uncinulina* to include such Silurian and Devonian species as agree in external shape and ornament with *Uncinulina fallaciosa* and *U. stricklandi*, i.e., flattened, slightly sinuated forms having the pedicle-valve with umbo incurved, concealing foramen and deltidial plates; the convex brachial valve with slightly raised fold; and the ornament in each valve consisting of from 20 to 30 prominent simple costæ not medianly grooved. The internal characters in addition to those already described in the brachial valve are the radiating vascular sinuses on the lateral and anterior portions of both valves below the muscle-scars. These and other characters of the interior of the pedicle-valve were well shown by Davidson[†], but the adductor muscle-scars are not seen for "*Rhynchonella*" *stricklandi*. The position of the muscle-scars and vascular sinuses of the brachial valve are shown in figs. 10 and 11.

A similar internal structure apparently exists in "*Terebratula*" *lewisi*, Davidson[‡], which may also be referred to the genus *Uncinulina*.

MERISTINA, Hall, 1867[§].

Terebratula obtusa, J. Sowerby, Proc. Linn. Soc vol. xii. pt. 2, pl. xxviii. figs. 3 & 4 (1818) (= *Atrypa tumida*, Dalman, Vet.-Akad. Handl. 1827 (1828), pl. v. figs. 3 *a–d*, p. 134).

Terebratula obtusa is described by J. Sowerby, in 1818, as "a shell curved laterally from the hinge, which must be very short without any space for triangular foramen externally . . . ." He figures the exterior, and in another specimen shows that the spirals had fifteen convolutions, and had their apices laterally directed, and that a median septum was present in the brachial valve. These specimens were obtained from "Sladacre's Quarry on right-hand side of road from Wych to Calwell Green, Malvern Hill." Judging by Sowerby's description and figures, there is no doubt that his species is identical with *Meristina* (*Atrypa*) *tumida*, figured by Dalman from Gothland, but the dimensions given by Dalman for his species are considerably less than those of the average fully-grown *Meristina obtusa* found in this country, and Dalman was apparently describing a young individual. *Meristina* (*Atrypa*) *tumida*, Dalman, therefore, is a synonym of *Meristina* (*Terebratula*) *obtusa*, Sowerby.

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[*] 'Palæontologica Indica,' n. s., vol. vi. no. 2, p. 40.

[†] Mon. Brit. Foss. Brach. vol. iii. pl. xxi. fig. 6 (1867).

[‡] Davidson, Bull. Soc. Géol. France, 2nd ser. vol. v. pl. iii. fig. 30, p. 330 (1848).

[§] 20th Rept. N.Y. State Cab. Nat. Hist p. 167.

IX.—*Note on the Nomenclature of the Coleopterous Genera* Chrysomela, *L., and* Melasoma, *Steph.* By S. MAULIK.

WHILE working on the Coleopterous subfamily Chrysomelinæ, in preparation for a forthcoming volume in the 'Fauna of British India' series, I have found it necessary to determine the genotype of *Chrysomela*. Bibliographical research has revealed the fact that Latreille cited the Linnæan species *Chrysomela populi* as the type of the genus. In his 'Considérations générales' (Paris, 1810), page 432, this citation stands thus:—"Chrysomèle, *Chrysomela populi*, F." Although Latreille referred to *Ch. populi* as Fabrician, yet it will be observed that Fabricius never proposed *populi* as a new species, and always referred to it as a Linnæan species. As it is such a well-known and common insect, there can be no doubt that *Ch. populi*, F. = *Ch. populi*, L., as stated by Latreille himself (Buffon, H. N. lxxxix., Crust.-Ins. xi. 1804, p. 380, sp. 15).

From the year 1758, when Linnæus published *Chrysomela populi*, to the year 1810, when Latreille cited it as the type of the genus *Chrysomela*, several authors enumerated species under the genus *Chrysomela* according to the scope of their studies, but nobody—not even Fabricius himself—attempted to fix a type for the genus. It may be stated that the conception of a genotype was given a definite shape by Latreille.

Unfortunately in 1831 Stephens, in erecting the genus *Melasoma*, cited *Ch. populi*, L., as the genotype without apparently knowing that it was already cited by Latreille as the type of *Chrysomela*. The result is that the name *Melasoma* becomes a synonym of *Chrysomela*, while another generic name has to be found for the assemblage of species known till now as *Chrysomela*.

In support of the proposed alteration consequent on the acceptance of Latreille's citation, I quote the following from the 'Proceedings of the International Congress of Zoology,' held at Monaco in 1913, published in 1914 p. 911:—

"The designation of genotypes by Latreille, 1810:—

"The 'Table des genres avec l'indication de l'espèce qui leur sert de types' in Latreille's 'Considérations générales' (1810) should be accepted as designation of types of genera in question (Art. 30).

"Vote: affirmative, 12; negative, 1; not voting, 2."

It may be mentioned that in the present case the whole thing has been judged on its merits, and that Latreille's citation has not been adopted without regard to all aspects of the question.

In considering what name should be assigned to the genus which has so long been known as *Chrysomela*, L., I find that among the synonyms *Polysticta*, Hope (Col. Man. iii. 1840, p. 164), cannot be used, because it is preoccupied for a genus of birds. In d'Orbigny's Dict. Univ. Hist. Nat. ii. (1843) Chevrolat proposed *Atechna* for one Australian and several South African insects. In my opinion *Atechna* is not congeneric with "*Chrysomela*," and should remain a separate genus for the South African species, and therefore the name *Atechna* cannot be used in lieu of "*Chrysomela*." In 1860 Motschulsky published (Schrenck's Reisen Amurl. ii., 1860) a number of genera which have since been sunk as synonyms of *Chrysomela*, L., and also designated the type in each case. From amongst these synonyms I select the name *Chrysolina*, the type-species being *Chrysomela staphylea*, L., which is a common European species.

Melasoma, Stephens, 1831, therefore falls as a synonym of *Chrysomela*, L., its genotype being *Chrysomela populi*, L., cited by Latreille in 1810, while *Chrysolina*, Mots., is adopted as the generic name for the large assemblage of species known for so long, and by many authors, as *Chrysomela*—*Chrysomela staphylaa*, L., being designated as its genotype.

In proposing this alteration, the responsibility is mine; but it may be mentioned that I have not decided to do so without full discussion with other entomologists working in the British Museum. In conclusion, I wish to express my thanks to Mr. J. H. Durrant and Mr. K. G. Blair for assistance in enabling me to consult the literature on this subject, and to Dr. Hugh Scott for the benefit of his opinion.

X.—*New African* Conops (*Dipt.*, Conopidæ).

By E. Brunetti.

The following notes and descriptions are based almost entirely on material loaned me by the Imperial Bureau of Entomology and the unnamed material in the British Museum. I have relied mainly upon Prof. Kröber's excellent revisionary papers on this family, and a number of my identifications have been very generously checked by Prof. Aldrich after comparison with Krober's collection, which has recently been acquired by the United States National Museum. Dr. Hugh Scott, of the Cambridge Museum, has also helped me by the loan of material from that Institution. The types of the following species have been presented by the Imperial Bureau of Entomology to the British Museum:—*Conops nigritarsis* ♂ ♀, *aurantius* ♀, *castaneus* ♂ ♀, *obscurus* ♂, *concolor* ♂ ♀, *unifascipennis* ♂, *rhodesiensis* ♀; *Physocephala fascipennis* ♀, *pubescens* ♂ ♀, *decisa* ♀, *halterata* ♀, *nigricoxa* ♂, *microvena* ♂ ♀. The types of *Conops obscurus* ♀, *aurantius* ♂, *Physocephala tuberculifera* ♂, and *Occemyia africana* ♂ have been presented to the British Museum through Dr. Hugh Scott. Amongst the Conopidæ kindly lent me by Prof. Poulton, belonging to the Hope Department, Oxford, only two African species are present—*Conops nubeculipennis*, Bezzi, and *Physocephala antiqua* To all those who have assisted me by the loan of specimens, I beg to tender my sincere thanks.

Table of Species of Conops.

A. A conspicuous round black spot on each side of head on fronto-facial line.
  B. A second pair of similar spots on upper part of frons .... *4-punctatus*, Krob.
  BB. No such second pair of spots.
    C. Legs uniformly deep blue-black, anterior femora on basal half, or more, bright orange-red. Very large striking species.
      D. Wings wholly deep blue-black ...... *erythrocephalus*, F.
      DD. Basal half of wings clear, remainder deep blue-black .... *conspicuus*, sp. n.
    CC. Legs never uniformly deep blue-black; if mainly black, then no part of the femora conspicuously bright red or orange.
      E. Wings wholly dark brown *.

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* Though E. and EE are apparently not well differentiated, it will be found in practice, after a little experience in the group, tolerably easy to decide in which group any species falls. In EE. the anterior half of the

F. Abdomen black, with yellow dust-bands. Tibiæ concolorous with femora ... . *rondanii*, Bezzi.

FF. Abdomen dull reddish brown, without distinct bands. Tibiæ black, conspicuously darker than and contrasting with femora .. . *nigritarsis*, sp. n.

EE. Wings never wholly dark brown: either only anterior half (to third or fourth vein) distinctly darker than remainder, or (*brunnipennis* only) grey with anterior half only slightly darker, but with submarginal cell always distinctly darker than the rest of wing.

G. Abdomen wholly with pale golden silky pubescence .... *braunsii*, Kröb.

GG. Abdomen wholly bright vermilion-red; thorax and antennæ dark red (former ? discoloured); wings distinctly yellowish on anterior half of basal two-thirds .... *aurantius*, sp. n.

GGG. Abdomen always differently coloured from the above two species in G. and GG.

1. Light chestnut-brown species: second and third abdominal segments in ♂, fourth also in ♀ (sometimes fifth also in ♀), with gold-dusted hind margins. Anterior and posterior halves of the wing less clearly demarcated in ♂ than in ♀ .... *castaneus*, sp. n.

2. Blackish-brown species (especially ♂): second and third abdominal segments in ♂ narrowly whitish dusted; in ♀, second narrowly, third broadly yellowish dusted; fourth segment in ♂ ♀ without dust-band, but ground-colour of hind margin pale in individuals. Submarginal cell, at least in considerable part, always darker than rest of wing. In some specimens almost pale grey .... *brunnipennis*, Kröb.

3. Reddish-brown species, sides of abdomen more nearly parallel than in most species: sides of second to fifth segments more or less reddish with hind margins

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wing is always definitely darker than the hind half, the line of demarcation being along the third or fourth vein, irrespective of the costal cell and first basal cell being all dark, partly infuscated, or wholly hyaline. The only difficult species to place is *brunnipennis*, Kröb., which partakes in this character of an intermediate nature.

indefinitely yellowish or whitish dusted. Wings brown down to third vein, including anterior and basal halves of first posterior cell . *zonatus*, Krob

4. Small black species: second to fifth abdominal segments with yellowish-grey hind-marginal dust-bands, coxæ black. Wings dark brown down to third vein, also nearly all first posterior cell, posterior cross-vein and fifth vein broadly infuscated .. . *obscurus*, sp. n

5. Almost uniformly dull maroon species; apparently only one distinct gold-dusted band on fifth segment * .. . ... *concolor*, sp. n

6. Small obscure species (near *obscurus*); base of abdomen narrowed; abdominal bands grey; fourth segment unbanded; wings nearly hyaline .... *unifascipennis*, [sp. n.

AA. No black spots on fronto-facial line.

H. Wings conspicuously and wholly brown, but paling a little towards hind margin . *elegans*, Mg., var [*fuscipennis*, Macq

HH. Wings with at most anterior half dark brown or brown (down to third or fourth vein), remainder obviously greyish or clear.

I. Wings pale grey, nearly clear, a narrow brownish-grey irregular band about filling submarginal cell, darker towards tip. (Anterior tarsi very broad, black.)

J. Small black species, abdominal dust-bands whitish; frons and face pale yellowish; apical half of submarginal cell distinctly blackish, rest of wing pale grey .... *ater*, Macq

JJ. Larger species (of the *elegans* group), always with some considerable part reddish, orange, or yellowish .. .. *nubeculipennis*, [Bezzi.

II. Wings with the usual black-brown band anteriorly.

K. Third antennal joint † distinctly shorter than second, at most two-thirds as long; costal cell nearly clear.

L. Orange-brown species with black markings; antennæ dull orange-brown, third joint bright reddish-orange, more shortly conical, gently tapering .... *semifumosus*, [Adams.

LL. Black species with very limited reddish markings; antennæ black, third joint more or less reddish basally.. *nigrocoxalis*, Krob.

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* Only one of each sex is present, the band is obvious in the ♀, but not so in the ♂, which, however, is considerably rubbed.

† Exclusive of the style.

KK. Third antennal joint* as long as second, elongate, more blade-like; costal cell as dark as adjoining part of wing; first basal cell quite hyaline; second and third abdominal segments each more than twice as long as first .... *rhodesiensis*, sp. n.

Conops 4-punctatus, Kröb.

Easily identified from all other species of the genus by the presence of a pair of round black spots on the upper part of the frons, in addition to the pair on the line of demarcation between the frons and the face common to many African species.

One ♀, Saw Mills, South Rhodesia, 31. xiii. 1921 (*Dr. Arnold*).

Described from the Belgian Congo.

Conops erythrocephalus, Fab.

This widely distributed deep blue-black species is also common in many parts of India, and is found still further East. It occurs in many localities in Nyasaland in March, May, June, August, September, October, and November, and no doubt during the intervening months also. Other data are as follows:—Caia, Zambesi, 26. viii. 1910 (*Dr. H. Swale*); Entebbe, 5. ix. 1910; 8. iv. 1913; 1, 15, & 20. v. 1913; 28. vi. 1912; Masaka, 12. iv. 1909, and Western Busoga, 29. vii. 1911 (all three localities, Uganda); Kola Valley, Portuguese East Africa, 8. iv. 1913 (*Dr. S. A. Neave*); M'tongosi, Zululand (*W. E. Jones*). In the British Museum from three localities in Laos, Indo-China.

Conops conspicuus, sp. n.

♂. *Head* and *thorax* absolutely as in *erythrocephalus*, Fab. *Abdomen* shining black in ground-colour, rather less tinged with deep blue, wholly covered with whitish dust (especially visible from in front). Front legs as in *erythrocephalus*; middle femora orange-red on about basal third; rest of legs all black. Wings with about basal half quite clear, the distal half moderately dark brown with a distinct purplish-blue tinge, the line of demarcation drawn rather irregularly from tip of auxiliary vein, through base of first posterior cell, middle of discal and third posterior cells, and ending at tip of anal cell, limited by seventh vein. Costal and subcostal cells wholly clear, submarginal cell wholly dark brown from its base. In all other characters exactly as in *erythrocephalus*.

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* Exclusive of the style.

An even more conspicuous species than *erythrocephalus*. Both of them stand out distinctly from all other South African ones by the wholly black bodies tinged with deep blue or violet, and by the deep blue-black of the wings, which fills only the apical half in *conspicuus* and the whole surface in *erythrocephalus*.

Long. 15 mm.

Described from 4 ♂ ♂ from Entebbe, Uganda, 1. iv. ; 1. v. (*type*) ; 15. v. 1913 ; Mavokota, Uganda, 20. iv. 1913 (all *C. C. Gowdey*).

Type in the British Museum.

Conops rondanii, Bezzi.

Several ♂ ♂ of this species are before me, of which two have been compared by Prof. Aldrich with named specimens in the Kröber collection. The black colour on the foveæ is variable, and the shining metallic outer side of the anterior tibiæ mentioned by that author is not noticeable in the present specimens, nor did I perceive it in the single ♂ in the Paris Museum identified by Krober. Mlanje, Nyasaland, 26. ii. ; 7, 17, & 20. iii. 1913 (*Dr. Neave*) ; Chirinda Forest, Gazaland, S. Rhodesia, March 1907 (*D. Odendaal*).

No ♀ ♀ have come before me.

Conops nigritarsis, sp. n.

♂ ♀. *Head* uniformly and wholly moderately bright brownish red including vertical space and occiput, the two latter parts with short sparse brown pubescence. Sides of face just below the two conspicuous black spots very pale shimmering whitish-gold, narrowing rapidly downwards to lower part of eye-margins, the shimmering visible only from above, whole head appearing unicolorous brownish red from below. Hind margin of eyes from about the middle downwards with almost whitish-gold shimmer; antennal foveæ with similar shimmer; antennæ concolorous with head; second joint about once and a half as long as first; third a little brighter red than the others, as long as second; style 3-jointed, second joint not projecting, third elongate, ending bristle-like in a fine point. Proboscis concolorous with head, black-tipped. *Thorax* uniformly concolorous with head, including scutellum, pleuræ, and metanotum ; no dorsal black stripes or markings, but some short black pubescence on dorsum. If viewed from in front, the dorsum is seen to be covered with a yellowish or yellowish-grey tomentum. Humeri with a little greyish dust; a rather narrow stripe of similar nature over middle of pleuræ from dorsum to middle coxæ. Metanotum sometimes with a little blackish, sometimes nearly all thus coloured, sides with silvery-white or yellowish-grey dust, sometimes only visible from above. *Abdomen* concolorous ; dorsum of first to fourth segments generally more or less blackish, sometimes almost wholly so on upper side; last two segments a little greyish-white dusted. Theca large and prominent. *Legs* concolorous ; coxæ whitish-dusted, tibiæ black, outer side with silvery-white shimmer, tarsi wholly black. *Wings* nearly uniformly dark brown, but a little yellowish-tinged basally and occasionally also in first basal cell ; halteres yellow.

Long. 14–15 mm.

Described from 3 ♂♂ and 3 ♀♀ from Mt. Mlanje, Nyasaland, 3–23. xii. 1912 (type ♂ 7. xii. 1912, type ♀ 20. xii. 1912) (all *Neave*) ; 2 ♂♂ and 1 ♀ respectively from Zanzibar, Natal, and Delagoa Bay.

Types in the British Museum.

This species differs from the others before me by the all-black tibiæ. This character it possesses in common with *ferruginosus*, Kröb. (which I have not seen), but in the latter the wings are nearly hyaline and the theca is very short. The main point of resemblance between these two species is the uniform colour of the body, though *ferruginosus* is reddish yellow. It was described from a single ♀ from the Cape.

C. bipunctatus, Lw., is also uniformly reddish yellow, but has three black thoracic stripes and red-yellow tibiæ, darker-tipped. *C. nigritarsis* should be distinct from both.

Conops braunsii, Kröb.

Two ♂♂ of this beautiful species from Bulawayo, South Rhodesia, 3. ii. 1923 (*Dr. Arnold*) ; Pretoria, 31. xii. 1914 (*G. A. H. Bedford*). One rather worn ♀ in the British Museum from Salisbury, Mashonaland, ii. 1900 (*Dr. G. A. K. Marshall*).

The pale yellowish-grey wings, with the large, conspicuous, elongate, blackish spot with ill-defined edges over the apical half of the submarginal and first posterior cells, with the pale silky-golden tomentum covering the whole abdomen, make this species easily identifiable. Kröber describes it from the ♀ only from Lindi, East Africa. He says the usual whitish pleural stripe is absent, but it is very distinct in one of the males before me and a little less so in the other. Kröber notes the hind tarsi as golden-yellow. In one of the above ♂ ♂ they are black, in the other a darker brown than the tibiæ.

Conops aurantius, sp. n.

♂ ♀. *Head.* Vertex and frons bright reddish brown, with a narrow, sufficiently well-defined, median black stripe from vertical region to upper side of antennal process. Face and lower part of head, except cheeks, pale honey-yellow with a silvery-white shimmer seen from above, including the foveæ, which latter, seen from below at a certain angle, show the same shimmer and are without any darker markings. Two black spots as usual nearly on level of antennæ. Proboscis orange-brown to tips, a little longer than head Antennæ orange-brown, second joint a little darker, owing, perhaps, to the minute black bristles which cover it, third joint more fiery-red, style 3-jointed, second joint projecting rather conspicuously on inner side, third elongate conical with sharply pointed tip. Cheeks broadly rather dark brown, the colour sharply delimited and continued hindwards and upwards over occiput. Latter narrowly lined with silvery white on lower half, a little short black hair on upper part. *Thorax* orange-brown, a broad median black stripe, with some black markings each side of it, the greater part of hinder half of dorsum also black. (In one specimen all the black markings have coalesced into an approximately quadrate spot, perhaps through discoloration only, leaving only the humeri and side-margins orange-brown.) Mesopleura, sternopleura, and hypopleura black or blackish, the silvery-white stripe distinct but not pronounced ; scutellum concolorous with thorax ; metanotum black, its sides and anterior margin concolorous with thorax. *Abdomen* uniformly bright orange, a few short bristly hairs at sides of first segment. Rest of abdomen almost entirely bare, except for a little whitish dust on sixth segment ; third and fourth segments with ground-colour narrowly pale yellow, but with pubescence or dust ; fifth with a row of minute black bristles on extreme hind margin ; sixth also with some similar bristles, all of them inconspicuous. Theca of moderate size. *Legs* orange, coxæ sometimes wholly so, sometimes blackish in parts, in both cases with white dust on front and outer sides. Outer sides of fore and hind tibiæ, and hinder and outer sides of middle pair, with silvery-white shimmer, especially the oval space on hind side, near tip, of middle pair. Claws black, more or less of last joint of anterior pairs, and hind pairs wholly orange-brown; pulvilli pale yellow, claws similar, with black tips. *Wings*: ground-colour rather pale grey; anterior part nearly down to third vein and extending distally to tip of marginal cell, also first basal cell, distinctly yellowish. All veins on basal half of wing, also the costal, auxiliary, first and second veins to their tips, distinctly orange-yellow. Apical part of wing blackish, the colour forming a large irregular spot, beginning in submarginal and first posterior cells at about anterior cross-vein, extending thence, deepening in its middle part, to wing-margin but sharply delimited hindwards by the spurious vein. Alulæ hyaline; halteres lemon-yellow.

Long. 12 mm.

Described from one ♂, Estcourt, Natal (*Dr. G. A. K. Marshall*), and two ♀ ♀, type, Bulawayo, S. Rhodesia, 21.xii.1919 (*Dr. Arnold*), type ♀; Chiromo, Nysaland (*R. C. Wood*).

Type in the British Museum.

Conops castaneus, sp. n.

♂. *Head.* Wholly bright lemon-yellow, frons barely darker, vertex dull yellowish, almost translucent; upper part of antennal process black, a narrow stripe running upwards nearly to vertex, with two small oval marks placed diagonally, just above base of antennal process. The usual two black spots on fronto-facial line. Foveæ and sides of face, when seen from above, with a pale golden-yellow shimmer, the facial stripe with clearly-cut inner edges. Cheeks with a brownish patch, occiput wholly lemon-yellow. Antennæ reddish brown, third joint more orange-red, second joint about once and a half as long as first or third; style three-jointed, second joint only slightly projecting on inner side, third elongate-conical to a very sharp point. Proboscis brownish, black-tipped. *Thorax* uniformly chestnut-brown; dorsum with a little yellowish dust; pleuræ with the silvery stripe conspicuous; metanotum with central part more or less blackish in individuals, sides yellowish-grey-dusted. In the ♀ three blackish stripes of the usual pattern are present on the dorsum. *Abdomen* chestnut-brown; first segment black, wholly yellow-dusted, with rather long bristly hair at sides more conspicuous than usual; second and third segments with gold-dusted hind margins, not so clearly outlined as in some species; the band on second segment spreading broadly over sides, that on third segment not extending forward at sides and leaving extreme hind margin of segment clear; fourth segment without trace of band, fifth and sixth segments with dense yellow dust. Male genitalia much larger than is usual in this sex. In the ♀ the yellow hind-marginal bands on the second, third, and fourth segments are broader. *Legs* chestnut-brown; coxæ and outer side of tibiæ with usual silver shimmer; tarsi black, hind pair a little darker than tibiæ. *Wings* pale grey, anterior half yellowish-tinged; submarginal cell from about anterior cross-vein to tip of wing blackish, the colour extending a little upwards and weakly into tip of first posterior cell. A very narrow infuscated line just in front of hind border of this latter cell, also the discal and third posterior cells. Alulæ a little clearer than rest of wing; halteres yellow.

Long. 13–15 mm.

Described from three ♂ ♂ and nine ♀ ♀: Cholo, 9.xii.1916, type ♂ (*R. C. Wood*); Mlanje, 7.xii. 1912, type ♀; 26. ii. 1913; 7, 17, 19. iii. 1913; Ruo, 4, 5. iii. 1913 (all *Dr. S. A. Neave*); Limpe, Nyasaland, ix. 1916 (*R. C. Wood*); Chirinda Forest, x. 1905 (*Dr. G. A. K. Marshall*, in Cambridge Mus.).

Types in the British Museum.

This is very near *rondanii*, Bezzi, in general appearance, but seems clearly distinct.

The frons and face are distinctly *yellow* from immediately below the dull yellowish, almost translucent vertex down to the mouth-border, there being hardly any line of demarcation between the two; the barely darker frons is only seen to be so when viewed from above.

The cheeks, which are as pale yellow as the face, have a streak of dark brown which I have not found in *rondanii*. The two black diagonally-placed marks above the antennal process are present in the three ♂ ♂ before me, but, though normally not present in *rondanii*, according to Kröber, are actually present in one specimen, with traces of them in the other specimen of that species. The thorax, in the ♂ at least, is apparently uniformly chestnut-brown in normal fresh specimens, with some yellowish dust, though the ♀ specimens present all possess three blackish stripes; the pleuræ in both sexes are concolorous, with a very distinct silvery stripe. The abdomen in the ♂ is bright chestnut-brown, the gold-dusted bands distinct but not clearly cut on second and third segments, the fourth segment without trace of a band, the fifth and sixth wholly golden-yellow-dusted. In the ♀ the gold-dusted bands are distinctly broader, including one on the fourth segment. The wings are brown down to the anterior cross-vein, but the first posterior cell, first basal cell, and all cells below them are pale grey, and a very narrowly infuscated line runs just in front of the hind borders of the discal first and third posterior cells.

Conops brunnipennis, Kröb.

Both sexes are present: Mt. Mlanje, ii., ix., xi. 1913 (*Dr. S. A. Neave*); Zomba (*H. S. Stannus*); Cholo, 14. ix. 1917 (*R. C. Wood*)—all Nyasaland; Umbilo, iii.–iv. 1915; Durban, 7. iv. 1913; Krantz Kloof, 3. iii. 1914 (*J. Haygarth*); Malvern, iii. 1917 (*G. A. K. Marshall*)—all Natal; Zungeru, N. Nigeria, 14. xi. 1911 (*Dr. Macfie*); Beira (*P. A. Sheppard*).

Conops zonatus, Kröb.

Four ♂ ♂ and two ♀ ♀: Pretoria, i., xi. 1916 (*G. A. H. Bedford*); Matopos, S. Rhodesia, 16. ii. 1919 (*Dr. Arnold*); Uchweni Forest, Brit. E. Africa, 1, 2. iii. 1912 (*Dr. S. A. Neave*); Khami Ruins, S. Rhodesia, 26. xii. 1921 (*Dr. Arnold*); Salisbury, S. Rhodesia (*G. A. K. Marshall*); Durban, Natal (*F. Muir*); Malvern, Natal, iii. 1897 (*G. A. K. Marshall*); S.W. of Lake Chilwa, 9. ii. 1914 (*Neave*); Somaliland.

I had assumed these specimens to represent a variety of Kröber's species, but a ♂ and ♀ sent to Prof. Aldrich were returned as true *zonatus*.

Conops obscurus, sp. n.

♂ ♀. *Head.* Vertex dull red-brown; frons black; face and cheeks ochraceous-yellow, wholly with silvery-white shimmer, seen from above. Two black fronto-facial spots. Foveæ with a narrow black stripe on the median ridge; sides as well as dorsum of antennal prominence black. Antennæ orange-brown, third joint a little brighter; second joint fully once and a half as long as first, third a little longer than first. Proboscis black, twice as long as head. Occiput blackish, a little white-dusted towards margins. *Thorax* black (? discoloured), including pleuræ and metanotum; latter a little white-dusted above. Humeri and scutellum orange-brown; mesopleura and sternopleura without distinct whitish stripe. *Abdomen* black, first segment a little white-dusted, second to fifth with well-defined gold-dusted hind margins, with a tendency to widening a little at sides; fifth and sixth segments with whitish dust. A little obvious black pubescence over whole abdomen, more noticeable than in most species. *Legs.* Coxæ black, white-dusted, femora and tibiæ orange-brown, anterior tibiæ with a little white shimmer on outer side; tarsi black: all metatarsi showing signs of brownish at base. *Wings* pale grey, band on anterior part rather dark brown, limited hindwards by third vein but filling first posterior cell and sometimes extending weakly over outer side of discal cell; hind margin of latter cell narrowly infuscated; spurious vein indicated by a nebulous line in first posterior cell only. Halteres yellow.

Long. 8 mm.

Described from a type ♂ from Umbilo, Natal, 28. iii. 1915 (*L. Bevis*); and two ♂♂ and a type ♀ from Durban (*F. Muir*). In the Cambridge Museum from Stella Bush, Durban, 8. ii. 1903 and 9. iii. 1902 (*F. Muir*), both ♂♂.

Type ♂ and ♀ in the British Museum.

Conops concolor, sp. n.

♂ ♀. *Head* almost uniformly a dull plum-red brown. Vertex a trifle more yellowish; two fronto-facial black spots; face more orange-brown, antennal foveæ with silvery-white shimmer, sides of face with pale gold shimmer up to the two frontal spots. Antennal first joint plum-coloured (rest missing), a little blackish about antennal process and on the transversely wrinkled frons. Occiput plum-coloured, about lower half of side-margins silvery-white lined. *Thorax* concolorous with head; dorsal space usually filled by the coalescing black stripes, with a dull orange tinge clear of sides and hind margin but reaching anterior margin. In ♂ traces of three narrow, well-separated, black vittæ. Pleuræ with considerable silvery-white shimmer, less so on humeri. Scutellum and metanotum concolorous with thorax, sides of latter with whitish dust. *Abdomen* concolorous; traces of a little blackish on dorsum of second to fourth segments, and of whitish dust at sides, also of yellowish-grey dust on sixth segment. *Legs* concolorous; coxæ and outer side of fore and hind femora, also outer side of all tibiæ with whitish shimmer; tarsi black. *Wings* grey, outer part of submarginal cell and most of first posterior cell slightly blackish. In ♀ basal half of anterior half of wing with a slight yellowish tinge. Halteres yellowish.

Long., ♂ 8 mm., ♀ nearly 10 mm.

Described from a ♂ and ♀ from Mt. Mlanje, 14.ii.1913, ♂, 3.ii.1913, ♀ (*Dr. S. A. Neave*).

Types in British Museum.

The ♀ shows a tendency to a more orange tinge than the ♂, but there can be little doubt of their specific identity.

Conops unifascipennis, sp. n.

♂. Considerably like *obscurus*. Third antennal joint obscurely blackish. Metanotum practically without conspicuous whitish dust. Abdomen distinctly narrower on second and basal part of third segment than in *obscurus*, practically bare on second, third, and fourth segments; yellowish bands on hind margin of second segment less well defined than in *obscurus*, and grey, not yellow; fourth segment without trace of band; sixth dull reddish with whitish-grey dust, leaving a large number of small, round, dot-like spaces of ground-colour bare. Wings uniformly very pale grey, nearly hyaline; submarginal cell a little blackish from base but distinctly so from anterior cross-vein to tip, the colour very sharply delimited by third vein and very slightly encroaching on the paler shade of marginal cell; spurious vein distinct but in first posterior cell only. In all else as in *obscurus*.

Long. 9 mm.

Described from a single ♂ from Pretoria, 29.xi.1914 (*G. A. H. Bedford*).

Type in the British Museum.

This species is almost intermediate between *Conops* and *Physocephala*, owing to the rather contracted base of the abdomen. The second vein ends distinctly beyond tip of discal cell, but not so far distally as is usual in *Conops*. The femora are regularly thickened, as is normal in this genus, but the hind tibiæ approach the irregular thickening characteristic of *Physocephala*.

Conops algirus, Macq.

This is probably only a form of the very variable *elegans*, Mg. The species seems well distributed in South Europe and extends (as var. *fuscipennis*, Macq.) as far as South Africa. Two ♀♀ in the British Museum, named by Col. Yerbury, agree with Macquart's description very well.

They are from Delagoa Bay and "Near base of Houdia Deidei, 16. vii. 1896." In the former specimen the sides of the second, third, and fourth abdominal segments are very broadly orange reddish, the remainder of the abdomen being wholly of similar colour. In the second specimen the reddish colour is very much more restricted and much darker. The essential differences in the three forms, *algirus*, *fuscipennis*, and typical *elegans*, appear to be the presence or absence of red on the abdomen, the extent of brown infuscation on the wings, and the presence or absence of dark stripes on the thorax.

The thoracic dorsum is very liable to discoloration, and the stripes themselves, when present, are probably liable to become confluent in individuals.

In three ♂♂ and two ♀♀ in the British Museum from Lahej, Arabia, near Aden, dated 9, 10, 19, and 30. iii. 1895, collected by Col. Yerbury, the thorax is wholly orange-brown, the abdomen to a moderate, but varying, extent reddish, the wings (except the yellowish costal cell) dark brown to the third longitudinal vein, with most of the first posterior cell also. It is evidently another variety of *elegans*, as noted by Col. Yerbury.

Conops elegans, Mg. (1824), var. *fuscipennis*, Macq. (1849).

Conops fumipennis, Adams (1903).

Five ♂♂ from Nyasaland and Durban are undoubtedly this form, according to Kröber's description, and two ♂♂ in the Paris Museum, although the two latter have no red on the abdomen; this in many species is frequently merely an individual variation.

Mt. Mlanje, 23. xii. 1912 (*Dr. S. A. Neave*); Ruo, 200 ft., 14. ix. 1916 (*R. C. Wood*); Lingadzi, near Domira Bay, 1700 ft., 2. viii. 1915 (*Dr. W. A. Lamborn*)—all three localities in Nyasaland; Durban, 10. iii. 1914 (*W. J. Haygarth*).

C. fumipennis, Adams, described from seven ♂♂ from Salisbury, South Africa (*F. L. Snow*), seems to me unquestionably synonymous. Cabaceira, Mozambique, 26. viii. and 28. ix. 1903 (*F. Muir*); Entebbe, Uganda, 3800 ft., 5–11. vii. 1911 (*Neave*).

Conops semifumosus, Adams (1903).

Conops pliuchus, Speis. (1900).
? *Conops bequaerti*, Kröber (1915).

These three species appear almost certainly synonymous, The only discrepancy with Adams's description in the eight ♂ ♂ and seven ♀ ♀ before me is that the second antennal joint is only from once and a half to once and three-quarters as long as the first or third, whereas Adams gives it as twice as long as either one of these joints, but the exact relative length is by no means specifically constant in the genus. I have little doubt of the synonymy of *pliuchus*, Speis., and *bequærti*, Kröb., the former described from Kilimanjaro, 25. xi. 1905, the latter from the Belgian Congo.

The specimens before me are from Ruo, 5. v. 1916; Limbe, ix. 1916; Cholo; Mlanje, 16. ii. 1915 (all *R. C. Wood*); Fort Johnston, 15. iii. 1915 (*Dr. W. A. Lamborn*); Zomba (*Dr. H. S. Stannus*)—all above localities in Nyasaland; Victoria Falls, 13. i. 1920 (*Dr. Arnold*); Matopo Hills, 11. iii. 1923 (*Dr. Arnold*); Bulawayo, Rhodesia, 1. iv. 1917 (*Dr. Arnold*); Lanwa, North Nigeria, 25. v. 1912 (*Dr. Scott Macfie*); East of Mt. Mlanje, Portuguese East Africa, 3–7. x. 1913 (*Dr. S. A. Neave*); Kaionga, N.E. Rhodesia, vii. 1910 (*Dr. Neave*); Durban, 22. i. 1903 (*F. Muir*); junction of Tugela and Blaauwkraantz Rs., Natal, x. 1896 (*G. A. K. Marshall*).

Conops bellus, Adams.

This is closely allied to the preceding species, but from the second antennal joint being at least twice as long as the first or third, coupled with the anterior tarsi being black only at the tips, and the base of the discal cell and the anal cell wholly light brown, it may be distinct. The remainder of the description is in full accordance with the characters possessed by all the species of the group round *fuscipennis*, Macq. No specimen has come before me, and the species rests apparently on the unique type ♂ from Salisbury, S. Rhodesia (*F. L. Snow*).

Conops nigrocoxalis, Kröb.

This, as Kröber says, is another form of the *fuscipennis*, Macq., group. It may, however, I think, claim specific rank by the mainly black pleuræ and antennal style, and the all-black coxæ and abdomen. As it was described from fourteen ♂ ♂ and seven ♀ ♀ from the Cape, the characters are presumably constant. Two ♂ ♂ and a ♀ in the British Museum are from Willowmore, Cape Province, xii. 1911 (*Dr. Brauns*), one of the localities from which the species was described.

Conops rhodesiensis, sp. n.

♀. *Head* ochraceous-yellow; vertex more brownish, frons brownish in middle down to antennæ. Face, except the rather broad yellow side-margins, with white shimmer, seen from above. Mouth-opening narrowly black-lined. Proboscis black, about once and a third as long as head. Foveæ with white shimmer, median ridge narrowly lined with black. Antennæ rather dull plum-red brown, first joint nearly cylindrical, three times as long as broad, second joint about once and a half as long as first, third as long as second, approximately elongate-conical, style three-jointed, third joint elongate, much longer than appendix. Occiput black, produced rather broadly behind lower part of eyes, where it is white-dusted. *Thorax* all black, including pleuræ and metanotum; humeri orange-brown, scutellum similar but duller, pleuræ indistinctly whitish-dusted, sides of metanotum more obviously so. *Abdomen* black, about hinder third of second segment dull red-brown, only slightly narrowed; second and third segments with broad white-dusted hind margins; a similar band on fourth segment just in front of hind margin, which latter is brown and bare; fifth and sixth segments more or less greyish-dusted towards tips; seventh segment orange-brown. Whole abdomen from third segment to base of seventh with rather conspicuous, stiff, black pubescence. Theca moderate in size, with some long black hairs. *Legs*: coxæ all black except front pair more or less orange-brown at base, all pairs white-dusted; femora and tibiæ orange-brown, hind femora broadly though indefinitely blackish in middle; tarsi black except more or less orange-brown at base. *Wings* pale grey, the anterior dark brown band extended to tip of wing and reaching hindwards to third vein, filling base of first posterior cell down to spurious vein, the colour extending anteriorly rather broadly; fifth vein very narrowly infuscated; first and second basal cells quite clear, also base of discal cell for a short distance. Halteres yellow.

Long. 11 mm.

One ♀, Rusapi, S. Rhodesia, 9. xii. 1920 (*Dr. Arnold*).

Type in the British Museum.

Conops nubeculipennis, Bezzi.

One ♂ from Caia, Zambesi R., 2. viii. 1910 (*Dr. H. Swale*). The second abdominal segment in this specimen is best described as being dark chestnut-brown at base, the colour disappearing gradually towards the hind margin under the light gold dust that covers all the rest of the segment. The third segment is more broadly chestnut-brown at base, nearly to the middle of the segment. The identity of the species has been confirmed by Prof. Aldrich. Two ♂♂ and a ♀ are in the Hope Department, Oxford, named by Col. Yerbury, from S.W. Arabia, 15 miles N.W. of Aden. In these the wings are nearly clear, except for the narrow very pale blackish-brown anterior band.

Conops ater, Macq.

One ♂ and five ♀♀; Cholo, Nyasaland; Ruo, Nyasaland, 3. v. 1916 (both *R. C. Wood*).

XI.—*Notes on some Australian Parasitic Nematodes.*
By H. A. Baylis, M.A., D.Sc.

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The following notes refer to material obtained in Queensland during Captain G. H. Wilkins's collecting expedition to Australia.

Serratospiculum attenuatum (Rud., 1803).

Syn. *Filaria attenuata*, Rud., 1803.

Several specimens of this species were collected from *Falco longipennis* in the St. George district. According to Seurat*, *Filaria guttata*, Schneider, 1866, recorded from *Falco borigera* (sic) [= *Hieracidea berigora*] from Adelaide, is identical with *F. attenuata*. This conclusion is supported by the agreement between the caudal papillæ of the male in Schneider's and Seurat's figures. *F. guttata* has been referred by Skrjabin † to his genus *Serratospiculum*, and in any case there can be no doubt that *F. attenuata* is congeneric with *S. turkestanicum*, the type of that genus.

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* Novit. Zool xxii. p. 23 (1915).

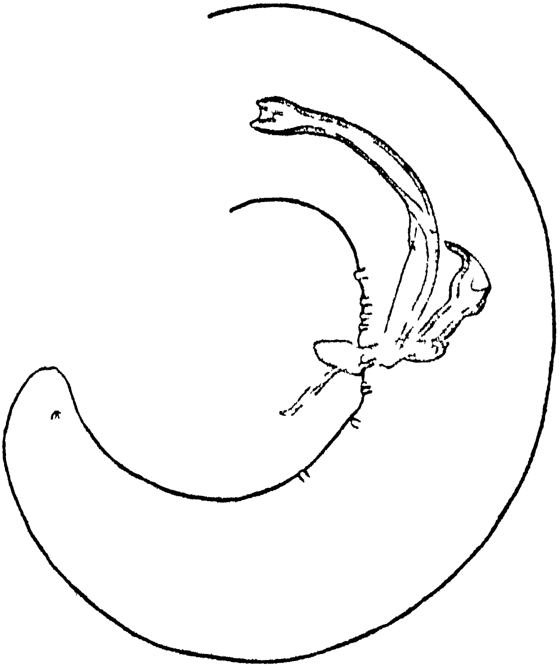
† Ann. Mus. Zool., Petrograd, xx. p. 540 (1910).

Acanthocheilonema australe (Linst., 1897). (Text-fig.)

Syn. *Filaria australis*, v Linstow, 1897, Arch. f mikr. Anat. xlix p 610, pl xxviii figs 6 & 7.

This species occurred in the "stomach cavity" (probably abdominal cavity) of a grey opossum (*Trichosurus vulpecula*) at Torrens Creek, North Queensland.

In general size and proportions the specimens agree fairly closely with the description given by von Linstow. The measurements of the spicules are somewhat different. In the single male available the longer (left) spicule measures about 0·7 mm. in length and the right spicule slightly less than 0·3 mm., while von Linstow gives 0·97 mm. and 0 24 mm. respectively.



Acanthocheilonema australe, caudal end of male; lateral view.

The shape of the right spicule is very characteristic. There is a massive barb at the tip, while at about the middle of the spicule there is a structure called by von Linstow a "Stützapparat" (*i.e.*, accessory piece). This, however, is probably a part of the spicule itself, and not a separate structure. It appears to be a somewhat bilobed expansion or outgrowth continuous at the sides with the shaft of the spicule, and passing round its dorsal side. It may, of course, be an accessory piece which has become fused with the spicule, but it is doubtful whether an accessory piece exists in any true Filariid. The left spicule has a stout tubular proximal portion and a distal portion consisting of a more slender shaft and somewhat inrolled alæ.

The number of caudal papillæ seems to be somewhat variable, and their arrangement not very symmetrical. Von Linstow mentions four pairs of preanal and five pairs of postanal papillæ. In the specimen examined there are four preanal papillæ on one side and five on the other. In addition to the five pairs of postanal papillæ mentioned by von Linstow, there is, near the tip of the tail, a pair of small lateral appendages or pointed papillæ, and the tail appears to terminate in a small button.

The general characters of this species, and especially the characters of the spicules and of the tail of the male, indicate that it should be referred to the genus *Acanthocheilonema*.

Acanthocheilonema roemeri (Linst., 1905).

Syn. *Filaria roemeri*, von Linstow, 1905, Arch. f. mikr. Anat. lxvi. p. 356, pl. xxiii. fig. 2.

Several specimens of this species were taken from the leg-joints of a grey kangaroo (*Macropus giganteus*) in the St. George district. They agree very well, on the whole, with the description given by von Linstow. The left spicule of the male, however, has a handle-like, tubular, proximal portion and a distal portion composed of a very slender shaft and delicate membranous alæ. There are, as stated by von Linstow, four pairs of large preanal papillæ and six pairs of smaller postanal papillæ. The latter are not, however, definitely arranged in two groups of four and two respectively on each side, but are somewhat irregularly disposed. The tail is very short, and no lateral subterminal appendages have been observed. Von Linstow was unable to detect any cephalic papillæ. Such papillæ are present, though extremely small and inconspicuous. In all probability there are, as usual, six of them.

The host and the situation in which the worms occurred make it extremely probable that this species is identical with the *Filaria Macropi majoris* of the Catalogue of the

Royal College of Surgeons of London (1830). Of this *F. Macropodis gigantei*, Dies., 1851, and *F. websteri*, Cobbold, 1879, are synonyms. Through the kindness of Mr. R. H. Burne, the writer has been enabled to examine the type-material of *F. Macropi majoris* in the Royal College of Surgeons. This, however, proved to be now in so poor a state of preservation that its identity with *F. roemeri* could not be established. No recognizable description prior to that of von Linstow seems to exist, and the name *roemeri*, therefore, has been provisionally retained. Like the preceding species, *F. roemeri* appears to be referable to *Acanthocheilonema*.

Physaloptera alata, Rud., 1819.

[Of Schneider, v. Linstow and Seurat, not of Ortlepp, 1923.]

A pair of specimens was collected from *Falco longipennis* in the St. George district.

The type-host of Rudolphi's species seems to have been *Falco* (i.e., *Accipiter**) *nisus*, though Rudolphi records it also from *Falco* (i.e., *Eutolmaëtus*) *pennatus* and *Falco* (i.e., *Circaetus*) *gallicus*. Ortlepp†, revising the types of Rudolphi's species of *Physaloptera* in the Vienna Museum, bases his description of *P. alata* on the material from *F. gallicus* and *F. pennatus*, which he calls "paratypes." The former set included both sexes, the latter females only. Ortlepp's figure of the tail must, therefore, represent a specimen from *Circaëtus gallicus*. The arrangement of the caudal papillæ in this figure differs distinctly from that figured by Schneider ‡ and by von Linstow §, and described by Seurat ‖ in specimens from *Falco biarmicus*. (Seurat also records the species from *Accipiter nisus*.) It seems possible, therefore, that the specimens described by Ortlepp should not be referred to *P. alata*, of which species they can hardly, in any case, be regarded as types or paratypes. Since, as Ortlepp suggests, *P. galinieri*, Seurat, 1914, has great resemblances to the material studied by him, it may be that Rudolphi's specimens from *Circaëtus gallicus* belonged to that species.

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* The corrected nomenclature here adopted is that of Sharpe's 'Hand-list of Birds,' vol. i. (British Museum (Nat. Hist.), 1899.)

† Proc. Zool. Soc. Lond. 1923, p. 1025.

‡ Monographie der Nematoden, 1866, p. 63. (The three papillæ on the anterior lip of the cloaca are omitted in this figure.)

§ Arch. f. Naturg. xliii. 1, pl. i. fig. 15 (1877).

‖ Novit. Zool. xxii. p. 16 (1915).

XII.—*The Genera* Favosites *and* Emmonsia *and the Species* Emmonsia parasitica (*Phillips*). By STANLEY SMITH, M.A., D.Sc., F.G.S., and BARBARA GULLICK, B.Sc.

[Plate VIII.]

H. M. EDWARDS and Jules Haime, 1851 (Pol. Foss. des Terr. Pal. p. 152), established the genus *Emmonsia* to include members of the Favositidæ in which certain of the tabulæ were incomplete.

They define the genus thus:—

"Polypier différant des *Favosites* en ce qu'il présente des planchers de deux sortes, les uns complets s'étendent dans toute la largeur des chambres et sont horizontaux; les autres incomplets sont obliques et s'appuient sur les premiers."

We find on close investigation that in the genotype—*E. hemispherica*—the tabulæ are entirely represented by tongue-like, or petal-like, plates, which terminate in a free edge and do not extend right across the corallite, although two such plates opposing each other may meet and apparently unite. In our finding we are in agreement with L. M. Lambe, 1899 (Contrib. Canadian Palæon. p. 11). To these plates Rominger, 1876 (Geol. Surv. Mich. Foss. Corals, p. 21), gave the name "squamulæ." He and Lambe appear to consider that "squamulæ" are of septal origin; but it is more probable that they are retrograde tabulæ.

Few workers in Palæozoic corals have recognized the genus *Emmonsia*. Not that these failed to appreciate the difference between its species and those of *Favosites*, sensu stricto, but because they considered the difference was insufficient to justify generic separation. Since these species demonstrate development in a definite direction—namely, the degeneration of the tabulæ,—we consider that the genus should be recognized.

Close relationship between species showing "*Emmonsia*" characters is not inferred. On the contrary, it is likely that these represent a phylogerontic stage common to several lineages of *Favosites*; and thus *Emmonsia*, like so many coral genera, is polyphyletic.

E. hemispherica shows the "*Emmonsia*" development in an advanced stage, but authors (Lambe, for instance, in "*F. basaltica* (Goldfuss)," *loc. cit.* p. 9) cite species in which the development has not proceeded to such a degree so that both squamulæ and tabulæ coexist in the same coral. This may be the case with some specimens of *E. parasitica*—the Carboniferous representative of the genus here described,—but in those specimens in which the internal characters are clearest, squamulæ are completely developed.

In this paper the genera *Favosites* and *Emmonsia* are emended, their genotypes briefly redescribed, and the Carboniferous species (*E. parasitica*) is discussed in greater detail.

FAVOSITES, Lamarck, 1816.

Histoire Naturelle des Animaux sans Vertèbres, vol. ii. p. 204.

Definition of Genus.—Tabulate coral. Corallum compound. Corallites contiguous and prismatic. Walls perforated by pores. Septa absent or merely represented by rows of spine-like processes. Tabulæ complete and more or less horizontal.

Genotype (genolectotype): *F. gothlandica*, Lamarck, *op. cit.* p. 206 = *corallium, gothlandicum*, etc., Linné, 1745, 'Corallia Baltica,' p. 89, fig. xxvii.*, a coral from the Silurian of Gothland. The genolectotype was chosen by H. M. Edwards and J. Haime, 1850, p. lx, from two genosyntypes. The other syntype is *F. alveolatus*, Lamarck, *op. cit.* p. 205 = *Madrepora truncata*, Linné, Esper, 1806, 'Forsetzungen der Pflanzenthiere,' vol. ii. pl. iv. figs. 1 & 2 (figure and name only, no description), and a specimen or specimens in Lamarck's collection ("mon cabinet").

Esper's figure is that of a rugose coral identified by him with *Madrepora truncata*, Linné, 1767, 'Systema Naturæ,' ed. xii. p. 1277 = *M. truncata*, Linné, 1758, 'Systema Naturæ,' ed. x. p. 795 = *Madrepora composita* etc., Linné, 1745, 'Corallia Baltica,' p. 22, fig. x., and was excluded from *Favosites* by Schweigger, 1820, 'Handbuch der Naturgeschichte,' p. 421.

Calamopora, Goldfuss, 1829, 'Petrefacta Germaniæ,' vol. i. (1829-37) p. 77, included *F. gothlandica*, but not *F. alveolatus*, among the eight genosyntypes, mainly species of *Alveolites* and *Favosites*; but since Goldfuss (p. 245) admits that *Calamopora* includes *Favosites* and *Alveolites*, and does not cite a genotype, the name is therefore merely a synonym of these genera.

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* 'Corallia Baltica' was republished in 'Amœnitates Academicæ,' 1749, and it is this edition that is quoted by most authors.

Favosites gothlandica, Lamarck.

1745. *Corallium gothlandicum* &c., Linné, Corallia Baltica, p. 39, fig. xxvii.
1749. *Corallium gothlandicum* &c., Linné, Corallia Baltica, Amœnitates Academicæ, vol. i p. 106, pl. iv. fig. xxvii.
1816. *Favosites gothlandica*, J. B. Lamarck, Hist. Nat. des Anim. sans Vert. vol. iii. p. 206.
1829. *Calamopora gothlandica*, G. A. Goldfuss, partim, Petrefacta Germaniæ, vol. i. p. 78, pl. xxi. figs. 3 *a e* [refers to Linnæus only].
1851. *Favosites gothlandica*, Lamarck, H. M. Edwards, and J. Haime, Pol. Foss. des Terr. Paleoz. p. 232.
1854. *Favosites gothlandica*, Lamarck, H. M. Edwards, and J. Haime, Brit Foss. Corals, p. 256, pl. lx. figs. 1, 1 *a*.
1879. *Favosites gothlandica*, Lamarck, H. A. Nicholson, Tabulate Corals, p. 46, text-fig. 14 *b* & *c*, pl. i. figs. 1, 1 *a*, & 3.

References to this species are very numerous, but this short list summarizes the history of the name and cites one or two works in which the species is discussed at some length. All the works quoted, except Goldfuss, consider specimens from Gothland either exclusively or among material from other regions.

Description.—The corallum is variable, but the discoidal form with a convex surface and a flattish base is perhaps the most typical. Hemispherical, pyriform, globular, and irregular-shaped coralla are common. The flat or obtusely conical base is clothed by a strongly and concentrically wrinkled epitheca, and shows a central point of attachment. Coralla may attain a foot or even more in diameter, but specimens less than 6 or 7 inches are more common. The discoidal corallum of *F. gothlandica* is well illustrated by the figures of certain species of *Heliolites* in Edwards and Haime's monograph (1854), pl. lvii. fig. 6, pl. lviii. fig. 2, and pl. lix. figs. 1, 2, & 3.

The corallites are contiguous and consequently prismatic, but they are easily separable, unless they are cemented together by recrystallization. In the same corallum they attain a fairly uniform diameter, usually about 2·5 mm., although in some colonies this may approximate 5 mm. The walls are extremely thin (about ·03 mm.) and are perforated by pores which, on the outside of the corallite, are surrounded by a small raised rim. The pores (between ·25 and ·3 mm. in diameter) are arranged in one, usually two, but sometimes three longitudinal rows on each of the five, six, or seven sides of corallite. The pores are not uniformly spaced, but on the average they lie 1 mm. apart. Those of one row usually alternate with those of the next, although certain pores of neighbouring rows may be in line.

Septa absent or feebly developed? *.

EMMONSIA, Edwards and Haime, 1851.

Pol. Foss. des Terr. Pal. p. 152.

Definition of Genus.—Differs from *Favosites* only in the tabulæ, which are wholly or mainly represented by squamulæ.

Genotype (genolectotype): *E. hemispherica* (Yandell and Shumard), Edwards and Haime, 1851, *loc. cit.* pp. 152 & 247 =*Favosites alveolaris*, Hall. 1843, Geol. of New York, p. 158, text-fig. 61, figs. 1 & 1 *a* on p. 157, and pl. xxviii. no. 31, figs. 1 & 1 *a*. Middle Devonian; Onondaga Limestone, Williamsville, Erie Co., Le Roy Genesee Co., Caledonia, Livingston Co., all in the State of New York.

Favosites alveolaris, Hall = *Calamopora hemispherica*, Troost, 1840, Fifth Geol. Rep. Tennessee, p. 72. Devonian: Falls of Ohio, Kentucky, and "Silurian" [? Devonian], Perry Co., Tennessee, and probably = *Favosites hemispherica*, Yandell and Shumard, 1847, Contrib. Geol. of Kentucky, p. 7. Devonian: Falls of Ohio, Kentucky.

The type is here chosen from two genosyntypes †:— *E. hemispherica* and *E. alternans*, Edw. & Haime, *loc. cit.* p. 248. Carboniferous: Belgium, ? Tournai.

Edwards and Haime clearly meant *E. hemispherica* to be the type, but did not say so in words. They merely gave it as the "example," after defining the genus, but exactly as they cite the "types" of the genera as such in 1850 (Brit. Foss. Corals, pp. xii–lxxxv).

Emmonsia hemispherica.

1840. *Calamopora hemispherica*, G. Troost, Fifth Geol. Rep. Tennessee, p. 72.

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* Edwards and Haime state that there are ten or twelve septa; Nicholson remarks, "septa usually obsolete or irrecognisable, sometimes represented by rows of tubercles or even by well-developed radiating spines" (p. 47); while Lamb speaks of "septal spines." We have not observed septa in any specimen. It may be pointed out that Edwards and Haime, although presumably basing their specific diagnosis upon specimens from Great Britain, may have considered American specimens also; Nicholson certainly did, and Lambe is describing American corals only.

† Three species are described, but since the third—*E. cylindrica*—is doubtfully included in the genus by Edwards and Haime, it is not to be regarded as one of the types according to the rules of nomenclature laid down by the 9th Congrès International de Zoologie, Monaco, 1913.

1843. *Favosites alveolaris* (Goldfuss), J. Hall, Geol. of New York, p. 157, text-fig. 61, figs. 1 & 1 *a*, and pl. xxxiii. no. 31, figs. 1 & 1 *a*.
1847. ? *Favosites hemispherica*, L. P. Yandell and B. F. Shumard, Contrib. Geol. of Kentucky, p. 7.
1850. *Alveolites hemispherica*, A. d'Orbigny, Prod. de Paléont. vol. i. p. 49.
1851. *Emmonsia hemispherica* (Yandell and Shumard), H. M. Edwards and J. Haime, Pol. Foss. des Terr. Pal. p. 247.
1853. *Emmonsia hemispherica* (Yandell and Shumard), H. M. Edwards and J. Haime, Brit. Foss. Corals, p. 218, pl. xlviii. figs. 4 & 4 *a*.
1859. *Favosites hemispherica* (Yandell and Shumard), E. Billings, Canadian Journal, new series, vol. iv. p. 105, figs. 5, 6, & 7.
1862. *Calamopora hemispherica* (Yandell and Shumard), C. Rominger, Amer. Journ. Sci. & Arts, ser. 2, vol. xxxiv. p. 394.
1874. *Favosites hemispherica* (Yandell and Shumard), H. A. Nicholson, Rep. on the Palæont. of Ontario, p. 49, pl. viii. fig. 3.
1876. *Favosites emmonsii*, C. Rominger, "Corals," Geol. Surv. Michigan, p. 26, pl. vii. figs. 1 & 2.
1879. *Favosites* (*Emmonsia*) *hemispherica*, H. A. Nicholson, Tabulate Corals, p. 67, fig. 15, pl. iii. figs. 3, 3 *a*, & 3 *b*.
1899. *Favosites hemispherica*, Edw. & H., L. M. Lambe, "Contrib. to Canadian Palæont.," Geol. Surv. Can. vol. iv. p. 11.

The coral that Edwards and Haime described as *Emmonsia hemispherica*, and intended for the type of the genus, admits of no uncertainty. It is the same as *F. alveolaris*, Hall, and is a common fossil in the Devonian Limestone in the State of New York and at Falls of Ohio. Its identity with *F. hemispherica*, Yandell and Shumard, and with *Calamopora hemispherica*, Troost, has, however, been disputed.

Rominger (1876, p. 25) has stated that all the original specimens of *Fav. hemispherica* kept in Dr. L. P. Yandell's collection are identical with *Favosites turbinata*, Billings (1859, Canadian Journ., new series, vol. iv. p. 109, and vol. v. p. 258, figs. 7 & 7 *a*), and therefore transposed the name "*hemispherica*" to Billings's species, and gave a new one—"*emmonsii*"—to Edwards and Haime's. Nicholson, on the other hand, has pointed out that whatever the corals that Rominger saw may have been, Yandell and Shumard's description, although vague, agrees with *E. hemispherica*, Edwards and Haime, *and does not agree* with *F. turbinata*, Billings. Yandell and Shumard distinctly say that the coral occurs in hemispherical masses, 1 to 10 inches in diameter, and is abundant at the Falls of Ohio; the corallum of *F. turbinata*, as a rule, has a very distinctive and unmistakable form—an inverted cone with a rounded base and curved apex,—the shape, in other words, of a rapidly expanding simple rugose coral. See Rominger, *loc. cit.* pl. vi. fourth figure.

The matter is, however, of secondary importance, since we identify Edwards and Haime's species with *Calamopora hemispherica*, Troost, which is prior to *F. hemispherica*, Yandell and Shumard. Edwards and Haime and Rominger do not refer to this coral, and were presumably unaware of Troost's work. The salient points of Troost's description are here given :—The fossil, as far as he had observed, only occurs in hemispherical masses. It is formed of tubes of such a size that nine of them occupy half an inch, and radiate from the centre towards the circumference. . . In the interior of the mass they are internally and externally prismatic. The 'transverse septa' are flat, and the connecting pores are placed in the middle of the sides.

Lambe placed both *Calamopora hemispherica*, Troost, and *Favosites hemispherica*, Yandell and Shumard, in his synonymy of *F. turbinata*, Billings, but preceded by a query. Nevertheless, "in the interests of science" he retained in their original use the trivial names "*turbinata*" and "*hemispherica*," only crediting the latter name to Edwards and Haime, and not to Troost or Yandell and Shumard, whose descriptions he contended were inadequate.

Description.—The corallum, which is characteristically hemispherical or sub-spherical, and often built up of superimposed layers, may attain considerable size—1 foot in diameter.

The corallites, although smaller (1–2·5 mm. in cross-section) and having a slightly thicker wall, are like those of *F. gothlandica*—contiguous, prismatic, separable,—and are perforated by vertical rows of collared pores of one size. The rows are, however, more regular and more closely set, the distance between them being ·4 to ·5 mm. One, two, or three rows occur on each side of the corallite, the number being determined by the width of the side. There are no septa * or true tabulæ, squamulæ take the place of the latter. The squamulæ are numerous, closely set, and alternate in position with the pores; they are irregular in shape, undulating in cross-section, and, although stout at base, become attenuated towards their free edge. They extend to, or even well beyond, the middle of the corallite, and those on one side meet or inosculate with those on the other.

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* In stating that there are no septa, we are at variance with Edwards and Haime (*loc. cit.* p. 247) and with Nicholson, 1879 ('Tabulate Corals,' p. 67). We believe that these and other authors have been misled by appearances (*vide* our note on figure of *E. parasitica*, p. 123).

Emmonsia parasitica (Phillips).

Holotype of *E. parasitica*, R. 78, British Museum (Gilbertson Coll.), "Carboniferous Limestone, Bolland."

1836. *Calamopora parasitica*, J. Phillips, Illustr. Geol. Yorkshire, vol. ii p. 201, pl. ii. figs 61 & 62.
1843. *Favosites gothlandica*, Lamarck (but ascribed to Goldfuss), J. E. Portlock, Rep. Geol. Londonderry, p. 320.
1844. *Favosites gothlandica*, Lamarck, and *Favosites* (?) *parasitica*, Phillips, F. M'Coy, Syn. Char. Carb. Limest. Foss., Ireland, p. 192.
1849. *Favosites gothlandica*, Lamarck (but ascribed to Goldfuss), F. M'Coy, Ann. & Mag. Nat. Hist. ser. 2, vol. iii. p. 134.
1851. *Favosites gothlandica*, Lamarck (but ascribed to Goldfuss), F. M'Coy, Brit. Palæoz. Foss. p. 80.
1851. *Favosites parasitica* (Phillips), H. M. Edwards and J. Haime, Pol. Foss. des Terr. Pal. p. 244.
1852. *Favosites parasitica* (Phillips), H. M. Edwards and J. Haime, Brit. Foss. Corals, p. 153, pl. xlv. fig. 2.
1869. *Favosites parasitica* (Phillips), A. Kunth, "Beitrage zur Kenntniss Fossiler Korallen," Zeitschr. Deutsch. Geol. Gesellsch. vol. xxi. p. 189.
1872. *Favosites parasitica* (Phillips), L. de Koninck, Nouvelles Recherches sur les Animaux Fossiles du Terrain Carbonifere de la Belgique, p. 137 and pl. xv. fig. 4.

Phillips's description of "*Calamopora parasitica*" is very short, but it is quite clear. It runs, "Incrusting; cells large, open, irregularly perforated." The figures are good, and, even were the type not available, would leave no doubt as to the fossil illustrated.

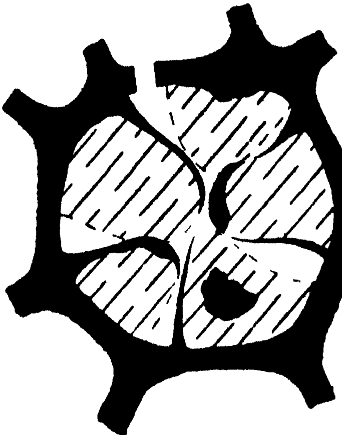
With the exception of Kunth, no author subsequent to Phillips has added much to his description beyond amplifying it and giving some details regarding size, etc. Kunth alone has noticed its internal characters.

M'Coy, upon his own admission, confused *Calamopora parasitica* with *F. gothlandica*. He recorded both species from the Carboniferous of Ireland (1844) and later (1849 and 1851) described a typical specimen from Derbyshire in the Woodwardian (now the Sedgwick) Museum, Cambridge, under the latter name. The specimen exists and has been examined by one of us.

Edwards and Haime's figure (1852) illustrates the typical form of the corallum. Unaware of the internal structure of the species, they included it under the genus *Favosites*.

Kunth described a small broken specimen from the Lower Carboniferous of Silesia (Hausdorf), noting that it had incomplete tabulæ, and suggested that the English specimens described by Edwards and Haime might also show the same characters, which, indeed, we have proved. He stated that it possessed complete tabulæ as well, but he may have been mistaken in this, since in section large squamulæ are very difficult to distinguish from true tabulæ. He anticipated us, moreover, in proposing to transfer the species to the genus *Emmonsia.*

Description.—The corallum is typically globular; it may be spherical, ovoid, or of a less symmetrical shape. Dendroid forms occur, but these are apparently rare*. The globular coralla usually range from half to one inch (1·5–2·5 cms.), but specimens with one diameter of two inches (5 cms.) are not unknown. The coral is generally found investing the stem of an encrinite, but some colonies appear to be independent of support, and the corallites then radiate outwards from the centre so that the whole surface exhibits calices.



Diagrammatic transverse section of *E. parasitica* (Phillips). The figure illustrates the squamulæ in simplified form, and shows how, in thin transverse section, the upturned edges of these appear as spiniform septa.

The solid lines represent the structure in the plane of section, the broken lines the remainder of the squamulare not in this plane.

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* One example only has come under our notice—a specimen in the British Museum (R. 22021) from Derbyshire. Although incomplete, this measured several centimetres in length and 1·5 cms. in diameter.

The corallites are contiguous, inseparable, and may be polygonal or circular in section. The corallite wall is much stouter than in *F. gothlandica* and *E. hemispherica*—about ·1 m. or more, but the thickening* is not uniformly distributed, being more concentrated at the angles—so much so in some cases that the interior of corallite is cylindrical. It is perforated by six or eight vertical rows† of pores ·25 mm. in diameter, at intervals varying from ·5 to 1 mm. Septa are not developed and tabulæ are mostly, if not entirely, replaced by squamulæ. The squamulæ vary much in size and in form, but they are more or less tongue-shaped, are uniform in thickness from their base to their edge, are usually much flexed, and curve upwards towards the calice like the petal of a flower.

Growth of a Colony.—A colony attached to an encrinite stem originates at a point and spreads round this support—the stem is not by any means always in the centre of the corallum (see Pl. VIII. fig. 9).

The growth of those colonies which show no supporting organism, but in which the corallites, nevertheless, radiate outwards from a centre, finds explanation difficult, unless, as we suspect, some anchorage was or is present, but which we have failed to detect. This may have been slender (the cirrus of a crinoid) and even possibly perishable (the stem of seaweed). The matter is referred to those who may have opportunities of further observation.

Localities and Horizons.—This list only mentions those localities from which the material examined has been obtained.

England:

Yorkshire and Lancashire: Craven District, mainly from Ravensholme, Pendle Hill. *Cheshire*: Ashbury, S W. of Congleton. *Derbyshire and Staffordshire*: various localities, including Castleton, Bradbourne (Wirksworth), Waterhouses and Wetton.

The horizon in each case being the uppermost Viséan—D_3.

Isle of Man:

Locality not known, material collected by the late Dr. Wheelton Hind. ? *Dibunophyllum* Zone.

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* The thickness of the wall separating two corallites is between ·2 and ·25 mm.—half of this is taken as the thickness of the wall of one corallite.

† The number of rows is difficult to ascertain, since we were not able to isolate the corallites.

Ireland :

Co. Dublin, Loughshinny, D_3; Co. Amargh, loc.?; Co. Donegal, Bundoran, C_2–S_1[*].

In the British Isles the species has only been found within the Viséan, and it has not yet been met with at all in the "S.W. Province." De Koninck records it from Belgium—doubtful from Tournai,—and if this locality is correct the horizon of the specimen is Tournaisian[†][‡].

Michelinia tenuisepta, var. *favositoides*, Vaughan, 1908, Q.J.G.S. vol. lxiv. p. 456, pl. xlix. fig. 11, from the "*Posidonomya* Zone," Loughshinny, Co. Dublin, holotype (thin longitudinal section figured), British Museum, R. 19597, closely resembles *E. parasitica* in the form of the corallum and in the size of the corallites. It differs, however, in having thinner walls and true tabulæ. Conclusions regarding this coral are inadvisable until more material has been examined. Vaughan states that the form "is common in, and characteristic of, the lower part of P" (at Loughshinny), and that it "immediately succeeds the maximum of the typical form of *Michelinia tenuisepta*." He adds that it is equally abundant in D_3, at Bradbourne (Derbyshire), but all the specimens that we have examined from this locality are typical examples of *E. parasitica*. *E. parasitica* seems to occur with "*Michelinia*" *tenuisepta*, var. *favositoides* at Loughshinny, since Mr. L. B. Smyth has sent us a specimen, which, although poorly preserved, appears to belong to the former species.

We thank Dr. W. D. Lang for his help; Mr. David Gibby, Mr. J. Wilfred Jackson, Mr. Donald Parkinson, Prof. S. H. Reynolds, the late Mr. Phillip Roscoe, Mr. L. B. Smyth, Mr. Henry Woods, and Sir A. Smith Woodward for the loan of material; and Mr. J. W. Tutcher for the photographs reproduced on Plate VIII.

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[*] Horizon stated by R. G. Carruthers, Geol. Mag. 1919, p. 441, which, he says, is locally developed as a γ-phase.

[†] J. Thomson (1883, Proc. Phil. Soc. Glasgow, vol. xiv. pp. 349–50, pl. iv. figs. 4 & 4*a*) records the species from Scotland (Renfrewshire and Lanarkshire), but we are not satisfied that the small form he described investing spines of products is really *E. parasitica*.

[‡] Edwards and Haime, 1851 (Pol. Foss. des Terr. Pal.), p. 64, mention a coral found at Button Mould Knobs, near Louisville, Kentucky, which they say is the same as *E. parasitica*. E. de Fromentel, 1869 (Introd. à l'Étude des Pol. Foss.), p. 269, therefore, quotes that locality as one in which the species occurs.

EXPLANATION OF PLATE VIII.

Fig. 1. ***Favosites gothlandica***, Lamarck. Upper Silurian, Gothland. Longitudinal section, natural size, cut from a specimen in the British Museum.

Fig. 2. ***Emmonsia hemispherica*** (Troost). Middle Devonian, Falls of Ohio, U.S.A Longitudinal section, ×2·5. Cut from specimen in British Museum. (56066.)

Fig. 3. The same Same specimen. View of several corallites, showing mural pores. ×2·5.

Fig. 4. *Emmonsia parasitica* (Phillips). Lower Carboniferous Viséan, D$_1$, Ashbury, S.W. of Congleton, Cheshire. Longitudinal section through the corallum, ×1·5. British Museum, Wheelton Hind Collection (R. 23024). Large corallum, not investing encrinite stem, but attached by base.

Fig. 5. The same. Viséan, D$_3$, Manifold Valley, near Swainsley, Staffordshire. Silicified corallum which has become detached from the encrinite stem it originally surrounded. Natural size. British Museum, Philip Roscoe Coll. (R. 23745).

Fig. 6. The same. Lower Carboniferous, probably Viséan, Isle of Man. Thin section, ×2·5. British Museum, Wheelton Hind Coll. (R. 23738).

In those corallites which are cut transversely the squamulæ appear like irregular spiniform septa.

Fig. 7. The same. Same specimen, polished section, ×2·5. British Museum, Wheelton Hind Coll. (R. 23739).

This "solid section," through its partial transparency, shows the true form of the squamulæ.

Sections R. 23738–9 were cut from an unusually large ovoid corallum in which no object of attachment could be detected. The corallites radiate outwards from the centre.

Fig. 8. The same. Viséan, D$_3$. Top of Pendleside Limestone, Ravensholme, Pendle Hill, Lancashire. Thin section, cut transversely through the corallum, ×1·5. Collected by Mr. Donald Parkinson. British Museum (R. 23740).

Note the excentric position of encrinite stem and also that in this specimen there appear to be tabulæ as well as squamulæ. This may be the case, although more probably the tabular-like plates are sections through large squamulæ.

Fig. 9. The same. Viséan, D$_3$, Derbyshire. Thin section, cut transversely through the corallum. Natural size. Philip Roscoe Coll. British Museum (R. 23746).

The slightly spiral habit of the corallum is well illustrated by this specimen.

Fig. 10. The same. Viséan, D$_1$. Top of Pendleside Limestone, Ravensholme, Pendle Hill, Lancashire. Thin section, cut longitudinally through the corallum. Natural size. Collected by Mr. Donald Parkinson. British Museum (R. 23740).

In this specimen the squamulæ have entirely perished—not an unusual occurrence in specimens of this coral.

Figs. 5, 8, 9, and 10 illustrate the more typical form of the corallum of *E. parasitica.*

XIII.—*A new Antarctic Copepod, belonging to the Genus* Eucalanus. By L. HARRISON MATTHEWS, B.A.

[Plate IX.]

IN examining the specimens of Copepoda in the Natural History Museum collected by H.M.S. 'Challenger,' Major Seymour Sewell, I.M.S., found the new species, belonging to the genus *Eucalanus*, here described.

Wolfenden ('Report of the British National Antarctic Expedition, 1901–04') found specimens of a *Eucalanus* among the plankton collections made by the S.Y. 'Discovery' at stations in 57° 25′ 30″ S., 151° 0′ 75″ E., and 56° 31′ 00″ S., 156° 19′ 30″ E. These he regards as possibly a variety of *Eucalanus subtenuis* or *E. mucronatus*. Only one specimen is amongst the 'Discovery' material at the Museum, and this is in very poor condition; but it is almost certainly the same species as that now described.

All the 'Challenger' specimens (five in number) are in the last calanoid stage of development, and, unfortunately, all are more or less damaged. The species is quite distinct from any other known *Eucalanus*, and can be readily distinguished by the elongated triangular head.

Eucalanus longiceps, sp. n. (Pl. IX.)

Head triangular and very elongated; in dorsal view there are lateral swellings at its base (Pl. IX. figs. 1 & 2). Distance from the base of the first antenna to hinder margin of the cephalothorax is 3½ times the distance from the base of the first antenna to the apex of the head. In dorsal view the outline of the segmented part of the thorax is rounded, whilst the hinder margins of the free segments are concave. Abdomen short and narrow, with three short joints in the male and female. Anal segment not separated from the furcal rami, which have an oblique outer margin bearing four bristles.

First antennæ in all specimens are damaged, but in the specimen having the longest they have twenty-one joints and reach to the posterior end of the abdomen.

Second antennæ (fig. 3).—Two bristles on the inner distal corner of the second basal, which is not separated from the first basal. Endopod two-jointed, the first joint bearing a bristle on its inner distal corner; the second joint has six bristles at the apex and six bristles on the lobe situated at the middle of the inner margin. The exopod is seven-jointed. The first joint bears four bristles on its inner edge, and is slightly longer than the sum of the lengths of the remaining joints. Joints 2–6 each bear a single bristle on their inner margin, and joint 7 bears one inner marginal and two terminal bristles.

Mandible (fig. 4).—Masticatory plate longer than broad, with eight teeth, the first three considerably larger than the remainder; the series terminates with a spine. Exopod, situated in the distal third of the second basal, incompletely two-jointed, and bears three terminal bristles. Endopod four-jointed, the first three joints each with a single bristle in the distal corner. The fourth joint bears two terminal bristles. The first joint is half as long as the second basal; the other three together are about half as long as the first.

Maxilla (fig. 5).—First inner lobe large, with eight stout spines. Second inner lobe very small, without bristles. Outer lobe smaller than the first inner one, with six large setæ. Second basal separated from exopod and endopod. Exopod, smaller than the endopod, bears one terminal and three outer marginal bristles. Endopod, about equal in size to the second basal, bears a terminal tuft of three bristles and three inner marginal bristles.

First maxilliped (fig. 6).—Nearly as broad as long, with six lobes. The first lobe bears three bristles and the sixth one; the remainder bear two each. The endopod is three-jointed and bears three terminal bristles. The second joint bears one lateral bristle.

Second maxilliped (fig. 7).—First basal slightly longer than second basal. Second basal with one hair and two serrated bristles near its distal end. Endopod five-jointed; the first joint with one serrated and one plumose inner bristle, second with two inner bristles, third with one inner bristle, fourth with one inner and one outer bristle, fifth with three terminal bristles.

Thoracic Feet: *first thoracic* (fig. 8).—Second basal with a large spine in distal inner corner. Exopod two-jointed, the last joint bearing five bristles and one outer marginal spine. Endopod, about twice the length of the first joint of the exopod, bears five bristles.

The second, third, and fourth pairs of feet in all specimens are damaged, having the exopods and endopods broken off. The fourth foot of a female is figured (fig. 9) having the first joint of the exopod and endopod present. The first joint of the exopod bears an outer marginal spine. Both basal joints bear an inner plumose marginal bristle.

Fifth thoracic (fig. 10).—Present in the male only; consists of three short joints with a small terminal seta.

Length 4·0 mm.

Locality. 'Challenger' Station 153 (14/2/72), 65° 42′ S., 79° 49′ E., 80 fathoms.

Syntypes. Five specimens in British Museum (Natural History).

EXPLANATION OF PLATE IX.

Eucalanus longiceps, sp. n.

Fig. 1. Dorsal view, ♀.
Fig. 2. Side view, ♀.
Fig. 3. Second antenna.
Fig. 4. Mandible.
Fig. 5. Maxilla.
Fig. 6. First maxilliped.
Fig. 7. Second maxilliped.
Fig. 8. First thoracic foot, ♀.
Fig. 9. Fourth thoracic foot, ♀.
Fig. 10. Fifth thoracic foot, ♂.

Not all drawn to same scale.

XIV.—*A new Subspecies of* Connochætes taurinus.

By Gilbert Blaine.

The following is a description of a new subspecies of the wildebeeste, *Connochætes taurinus*, obtained by Major Powell-Cotton in Angola.

Connochætes taurinus mattosi, subsp. n.

Forehead greyish brown with an intermixture of black hairs in the crown and a lunate marking of lighter brown between the eyes. Face-tuft black and very bristly, lips dirty white; back of ears black, inside dirty white.

The whole of the body slaty-ash colour, darkening on flanks to a blacker shade, without a trace of the reddish-roan shade that appears in *taurinus*.

The brindled markings on neck and shoulders very indistinct, and disappearing on the body and hind-quarters. Legs dull slaty brown.

Mane and tail black.

Cotypes.—1. Ad. ♂, stuffed, with skull and horns, in the Quex Park Museum, Birchington, Kent, shot by Major P. H. G. Powell-Cotton at Chiácusse, Huilla District, Cunene River, on November 24th, 1921, and numbered Field No. 66.

2. Ad. ♂ skin and skull in the Quex Park Museum, Birchington, Kent, shot by Major Powell-Cotton on the Bamber River, tributary of the Cunene River on December 27th, 1921, and numbered Field No. 108.

3. Ad. ♂ skin and skull, shot by Major Powell-Cotton, at Chicoonga, N.E. of Dongo, on January 17th, 1922, and numbered Field No. 117; presented by Major P. H. G. Powell-Cotton to the Nat. Hist. Mus., S. Kensington.

This wildebeeste was obtained by Major Powell-Cotton in December 1921, when on a journey through Angola from Mossamedes northwards by way of the Cunene River.

I will quote from his own notes, giving details of the locality in which it was found and other interesting particulars:—

"The only ground where I found the Wildebeeste was on the River Cunene and its tributaries, eastward from Capalonga, on the boundary between Benguela and Huilla Districts. Here the elevation was about 4000 feet and the country park-like, with open grass glades stretching back from the river banks.

"At the end of November, on open ground at Chiacusse, I spotted the first beast, a single male in the company of a male Roan, and bagged it with a long shot. Two days later another single male was seen with another young male Roan, and again on the 30th, another male with a small herd of Roan. A month later I secured a second specimen on a small tributary flowing into the Cunene from the east, although a younger animal than the first. This was a solitary male, with no Roan companions.

"The only herd met was in mid-January at Chicoonga, some six hours' trek N.E. of Dongo. We came on a party of three males feverishly digging up the ground with their horns, and as I fired at one of them, some five or six females and young feeding near by galloped off.

"In the sixty-seven days spent on the ground, only four single males, a party of three males, and the one small herd were seen.

"From this it must be inferred that they were not plentiful in that part of the country at that season. The natives, however, repeatedly stated that they were to be found in greater numbers further to the S. East."

Major Powell-Cotton has expressed a wish that this wildebeeste should be named *mattosi*, after Sir John Norton de Mattos, K.C.M.G., late Governor of Angola.

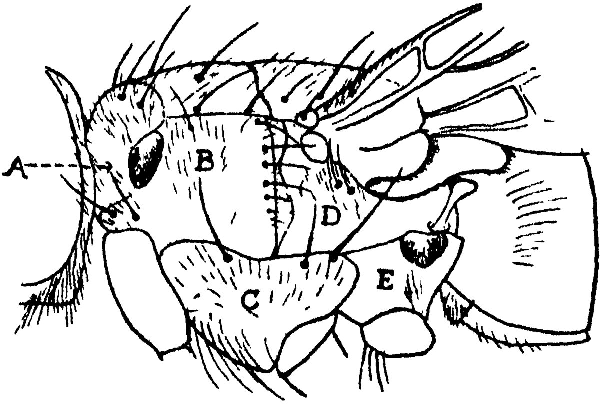
XV.—*Exotic* Muscaridæ (*Diptera*).—XV.* By J. R. Malloch, Bureau of Biological Survey, Washington, D.C.

Subfamily *Muscarinæ*.

Genus Musca, Linné.

The generic name *Musca* has been declared by Townsend to be applicable, according to strict conformity with the rules of the International Zoological Congress, to the group now generally known as *Calliphora*, and he has proposed, as a substitute for *Musca*, the generic name *Promusca*. As I am more concerned with the identification of organisms than with questions of nomenclature, I leave the final adjudication of the matter to those who have a mind to grapple with it, and use the name *Musca* in its generally accepted sense, with *domestica*, Linné, as type.

Fig. 1



Lateral view of thorax of *Musca domestica* L. A, propleural hairs; B, mesopleura; C, sternopleura; D, pteropleura; E, hypopleura.

For some years I have been trying to devise a method for the more reliable identification of species of this genus, and, after an intensive study of specimens from all parts of the world, I have arrived at the conclusion that there are several well-marked groups in the genus, all of which have already been recognized by one or more workers, but unfortunately without very materially improving the situation, insofar as specific identifications are concerned. In the hope that an elucidation of the group-characters may lighten the future work of students, I present a key to the segregates based upon characters which are readily appreciated and invariably present in each of the respective segregates. Some of these characters have already been used by the describers of the named segregates, others are here used for the first time in connection with this genus, though I have made use of them in other genera in this family in this series of papers.

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* For Part XIV., see Ann & Mag. Nat. Hist. (9) xiv, November 1924, pp. 513–522.

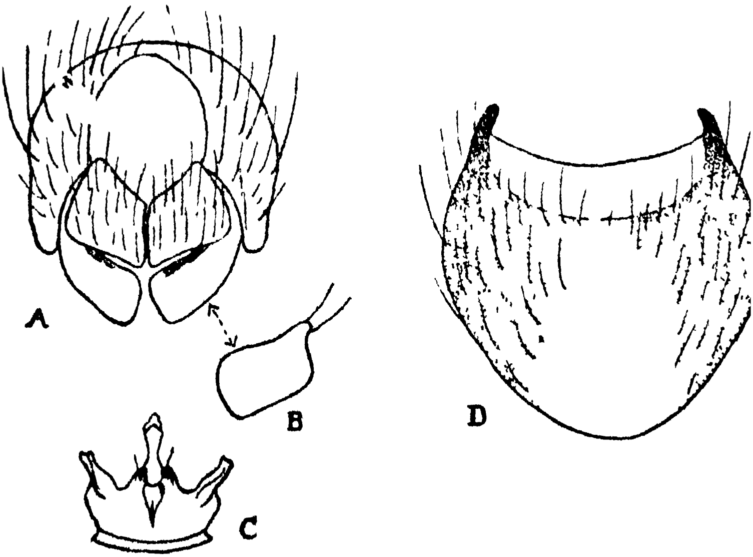
To facilitate the use of the synopsis in this paper I give a figure of the pleura of *Musca domestica*, Linné (fig. 1), showing the various sections of the pleura and their armature. The figure is diagrammatic and shows the hypopleura more exposed than is the case in actual specimens; this condition may be simulated in specimens under examination by turning them slightly round to expose the rounded posterior portion of the pleura. The head is often so closely appressed to the front margin of thorax that it is difficult to distinguish the small depressed portion of the propleura, and the hairs on humeral callosity and those on lower margin also sometimes curve over so that it is possible to mistake them for hairs actually situated upon the median portion. However, with ordinary care, and the use of a good binocular microscope, no trouble need be apprehended in distinguishing the characters used in the key.

The ridge along lower margin of declivous portion of mesonotum consists of either one or two chitinized plates along the upper margin of the thoracic squama or calyptra extending from the root of wing to the anterior lateral margin of the scutellum at its lower level. This plate or ridge is best seen when the wing is bent downward, allowing a clear view of the area above the calyptræ. The presence or absence of hairs on this ridge is quite an important character in this and related genera. In the key the ridge is referred to as the "suprasquamal ridge."

It is difficult to assign a definite status to the segregates herein accepted, for, while some workers would consider them as valid genera, others would just as certainly rank them at most as subgenera, or even refuse to accept them as named divisions. It is true that the genus contains a fairly uniform series of species, but there are some of these, notably *crassirostris*, Stein, which differ both in structure and habits so very markedly from the genotype of *Musca* that one is compelled to consider them as sufficiently distinct to warrant their removal from *Musca* in the strict sense.

While the characters listed infallibly remove many species to their different groups, it is unfortunately the case that genitalic characters of the males do not appear to yield appreciable characters for the separation of closely related forms within these groups. I have made a careful comparison of the male hypopygia of *domestica* from North America with the form possessing a narrower frons, which I take to be *vicina* as identified by Patton (fig. 2), from the Straits Settlements, and can find no differences that can be appreciated as of specific value. It is true also that *ventrosa*, Wied., is very similar in the male genitalia to those two forms, the only notable distinction I find being in the form

Fig. 2.



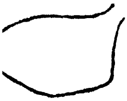
Hypopygial characters of *Musca vicina*, Mcq.? A, hypopygium from behind; B, inferior clasper; C, internal hypopygial parts; D, fifth sternite.

of the inferior clasper (fig. 3). There is, however, a rather marked difference both in the form of the fifth ventral abdominal segment and of the parts of the male hypopygium between these three species and one belonging to *Viviparomusca* which I have dissected (fig. 4). It is probable that there are very few distinct species in this last group, possibly but one or two, but how many there are I leave for decision to those who may have sufficient material and a knowledge of the early stages to warrant definite conclusions. I suspect that there are but one or two widely distributed species.

By far the largest number of names are referable to the group *Biomyia*, R.-D. How many of these are valid species I cannot say, but suspect that there are many synonyms which only careful taxonomic work and a study of the early stages will disclose.

Fig. 4.

Fig. 3.



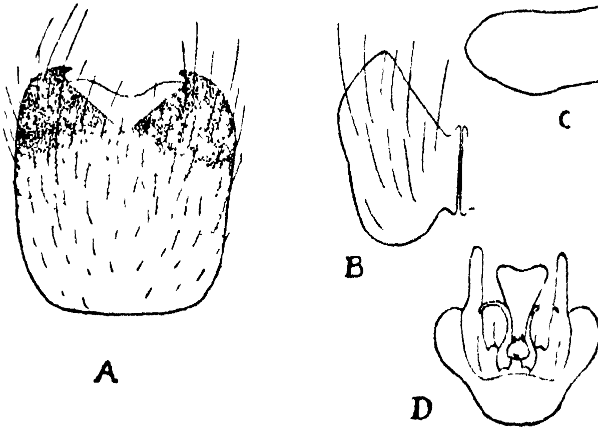


Fig. 3.—Inferior hypopygial clasper of *Musca ventrosa*, Wied.
Fig. 4.—Genital features of a species of *Viviparomusca*. A, fifth sternite; B, superior clasper, left; C, inferior clasper; D, internal hypopygial parts.

Under the different named segregates listed after the key I have grouped the species which I have examined. Most of these are in the collection of the United States National Museum, having been named and donated by the persons whose names appear after the species names in the list. I have made no attempt to verify the specific distinctions, but the list at least suggests that identifications in *Musca* are not too reliable even to-day.

Segregates of Musca, *Linné*.

1. Propleura haired in middle, *i. e.*, erect hairs present below humeral angle and above the bristly hairs on lower margin (fig. 1); mid-tibia without a strong antero-ventral bristle beyond middle; suprasquamal ridge bare . *Musca*, Linné.
Propleura bare in middle .... 2.
2. Lower calyptra with numerous erect black hairs on disc above near base; supra-

	squamal ridge with numerous setulose hairs; proboscis rather thick.	*Ptilolepis*, Bezzi.
	Lower calyptra without erect black hairs on disc	3.
3.	Mid-tibia with a distinct antero-ventral bristle beyond middle; proboscis conspicuously thickened, rounded and glossy below; suprasquamal ridge bare	*Philæmatomyia*, Austen.
	Mid-tibia without an antero-ventral bristle; proboscis normal	4.
4	Suprasquamal ridge with setulose hairs	*Viviparomusca*, Townsend.
	Suprasquamal ridge without evident hairs	*Biomyia*, Robineau-Desvoidy.

Genus PHILÆMATOMYIA, Austen.

Genotype, *Musca crassirostris*, Stein.

This genus is known to me only from the genotype, which occurs in Africa, southern Asia, and many of the larger islands in the East Indies.

Genus MUSCA, Linné.

Genotype, *Musca domestica*, Linné.

The genotype occurs in the Americas and Europe and Asia. There are two species in the United States National Museum, named by Bezzi as *angustifrons*, Thom., and *albomaculata*, Mcq., which belong here. Others which I have seen from the East Indies are in my possession, one of them being evidently the species identified as *vicina*, Mcq., by Patton, the other I have not identified as yet. It may be noted in passing that Patton has placed *angustifrons*, Thomson, as a synonym of *sorbens*, Wied., and as that species, as identified here by him, falls in *Biomyia*, he and Dr. Bezzi do not agree in their identifications as expressed in the material I have seen.

Genus VIVIPAROMUSCA, Townsend.

Genotype, *Musca vivipara*, Portchinsky.

In the United States National Museum there are specimens determined as follows:—*vivipara*, Port., *bezzii*, Patt., *pattoni*, Bezzi, *lusoria*, Wied., determined by Bezzi; and *gibsoni*, Patt., and *bezzi*, Patt., determined by Patton. There is only one female of *gibsoni*, the male along with it belonging to *Biomyia*, though identified by Dr. Patton as *gibsoni* also. Specimens which I have tentatively identified as *bakeri*, Patton, from the Federated Malay States, belong to this genus.

Genus Biomyia, Robineau-Desvoidy.

Genotype, *Musca tempestiva*, Fallen.

This is the same as *Eumusca*, Townsend, and *Placomyia*, R.-D., the characters of the genotypes being the same. It must be noted that the spelling of Robineau-Desvoidy's generic names has been changed to conform to linguistic rules by Bezzi.

In the United States National Museum there are specimens named by Bezzi as follows:—*nebulo*, Fab., *nigrithorax*, Stein, *spectanda*, Wied., *biseta*, Hough, *corvina*, Fab., *tempestatum*, Bezzi, *dorsomaculata*, Mcq.; by Patton: *ventrosa*, Wied., *planiceps*, Wied., *vetutissima*, Walk., *gibsoni*, Patt., male, *sorbens*, Wied.; paratypes: *terræ-reginæ*, J. & B., *fergusoni*, J. & B.; and *australis*, Macq., named by Hill.

Patton has already sunk some of these names as synonyms of others in the list, but much work yet remains to be done before we can arrive at final results. I am of the opinion that some at least of these so-called species are merely colour-varieties of others, and rearing specimens from known parents will have to be done under various conditions in order to test out the limits of species in this genus, unless it is found possible to differentiate them by means of structural characters of the male hypopygia or other parts of the body. Whether or not the comparative width of the frons of the males is a reliable character in this group remains to be proven. In some genera this character is reliable, in others it is certainly not to be depended upon.

Genus Dichætomyia, Malloch.

I present descriptions of some new species of this genus the type-specimens of which will be sent to the British Museum in accordance with the request of their collector who submitted them for identification.

Dichætomyia latistriata, sp. n.

Male.—Head brown, with white pruinescence, centre of occiput below, clypeus, antennæ, and palpi yellow. Thorax orange-yellow, disc of mesonotum brownish fuscous, the centre with a broad, whitish, pruinescent vitta, which gives the dorsum the appearance of having two broad fuscous vittæ, most conspicuous when seen from behind; pleura, metanotum, and scutellum yellow. Abdomen concolorous with thorax, disc of third and fourth visible tergites largely blackened. Legs orange-yellow, mid and hind tibiæ more brownish, tarsi fuscous. Wings yellowish, veins brown. Calyptræ and halteres orange-yellow.

Frons linear, interfrontalia obliterated above, each orbit with about three bristles in front; ocellar bristles long; cheek very narrow; parafacials obsolete from side; third antennal segment fully three times as long as second; palpi slightly dilated and almost bare apically. Thorax with 2 + 3 dorso-central bristles; anterior intra-alar bristles short; scutellum bare on sides below bristles. Abdomen ovate; basal sternite hairy, fourth tergite with apical and lateral median bristles. Fore femur with four or five rather long and not closely placed antero-ventral bristles on apical half; fore tibiæ without a median posterior bristle; tarsi normal; mid-femur with a few short, stout, antero-ventral bristles on apical third; mid-tibia with two posterior bristles; hind femur with about five short antero-ventral bristles on apical third and about three fine postero-ventral bristles on median third; hind tibia with one antero-dorsal and about three short antero-ventral bristles. Outer cross-vein oblique, curved; fourth vein bent but little forward at apex.

Length 10 mm.

Type and one paratype, Kuala Tahan, Pahang, F.M.S., November 25 (*H. M. Pendlebury*).

This species and the others described in this paper be'ong to the group in which the fore femur has short bristles on the apical third or more of the fore femora on the antero-ventral surface. I have in press at this time a paper in which I present a key to the Philippine species of the group, and when this has appeared in print I purpose publishing a key to the whole of the species to facilitate their identification. There are about seven species of the group known to me.

Dichætomyia pahangensis, sp. n.

Male.—Head as in the last species, but the palpi are brownish in type, which colour may not be normal. Thorax tawny-yellow, dorsum with grey pruinescence, which when seen from behind forms three pale vittæ that are most distinct anteriorly, the median one broad, the others narrower and situated on the line of dorso-central bristles. Abdomen rather uniformly glossy brownish on dorsum. Legs tawny-yellow, tarsi hardly darker. Wings more conspicuously yellow than in the last species.

Head as in *latistriata*, but the triangle above antennæ is larger and there are more orbital bristles. Thorax and abdomen as in *latistriata*; fore femur as in that species, but the antero-ventral bristles shorter, stouter and closer together; hind femur with a number of short bristles on apical third of postero-ventral surface; middle legs lacking in type. Venation similar to that of last species.

Length 10 mm.

Type, Gunong Tahan Padang, Pahang, F.M.S., December 22 (*H. M. Pendlebury*).

Dichætomyia pendleburyi, sp. n.

Male.—Similar in colour to the last species, the palpi pale yellow, dorsum of thorax darker, with the same pruinescent vittæ, the third and fourth visible tergites like those of *latistriata*, and the wings less vividly yellow.

Structurally similar to *pahangensis*, but the hind femur lacks the short bristles on apical third of postero-ventral surface.

Length 7–8 mm.

Type and one paratype, Pahang, Wray's Camp, 3300 feet, December 10 (*H. M. Pendlebury*).

Named in honour of the collector.

Dichætomyia pectinipes, Stein.

Female.—A specimen which I take to belong to this species differs from the male which I have seen from the Philippines in having the third antennal segment largely infuscated apically. In other respects it agrees with the male. The frons is about one-fourth of the head-width at vertex, slightly widened anteriorly, and each orbit has one strong and two weak anterior and one strong and one or two weak posterior bristles.

Length 7 mm.

Locality. Cameron's Highlands, Pahang, F.M.S., 4000 feet, June 17 (*H. M. Pendlebury*).

Originally described from Java.

Genus MELANOCHELIA, Rondani.

This genus, as represented in New Zealand, contains several groups which are entitled to at least subgeneric rank. One of these is dealt with in this paper and four of the species are tabulated. It is extremely probable that more species of this group will be found with intensive collecting.

Subgenus MILLERINA, nov.

Generic Characters.—Eyes hairy; frons in both sexes about one-fourth of the head-width, with narrow orbits which are setulose on their entire length, upper bristles curved outward over eye at level of anterior ocellus, the others more or less incurved; arista very short-haired, antennæ not elongate; proboscis and palpi normal, parafacials sometimes bare below level of apex of second antennal segment. Prealar bristle absent; sterno-pleurals 1 : 2; hypopleura bare. Basal abdominal sternite bare; fifth sternite in male with a deep rounded posterior excision. Fore tibia with a median posterior bristle; fourth segment of fore (or fore and mid) tarsi in male usually noticeably compressed and produced downward at apex below; mid-tibia with one antero-dorsal and two or more postero-dorsal bristles; hind tibia with two antero-dorsal and one postero-dorsal bristle, the latter before middle, the preapical bristle long. Wing-veins bare, first posterior cell not narrowed at apex.

Genotype, *Millerina pennata*, sp. n.

Genus named in honour of David Miller, Entomologist of New Zealand.

Key to Species.

1. Thorax with three pairs of postsutural dorsocentral bristles; femora, apical segment of fore and mid tarsi, and all of hind tarsi blackish; 3rd and 4th segments of fore tarsi in male slightly compressed, apical segment of mid-tarsi densely fringed with black hairs along each side, the hairs as long as the slightly broadened segment .... *limpida*, Hutton.
   Thorax with four pairs of postsutural dorsocentral bristles .... 2.
2. Apical segment of mid-tarsus fringed as in *limpidus*; legs similarly coloured, but the hind tarsi not so dark; 4th segment of fore tarsus conspicuously compressed and produced below at apex, 5th slender and about twice as long as 4th .... *pennata*, sp. n.
   Apical segment of mid-tarsus not fringed as above . 3.
3. Femora black, grey-pruinescent .... *nigrifemur*, sp. n.
   Femora tawny-yellow, sometimes greyish apically . *hudsoni*, sp. n.

Millerina limpida (Hutton).

Originally described as a *Trichopticus*. I have before me the type female.

Male and Female.—Head black, frons, face, and cheeks densely whitish-grey pruinescent; antennæ and palpi black. Thorax black, densely grey-pruinescent, darker on dorsum and with three slender brown vittæ, the central one most distinct; scutellum with a faint brownish spot on each side at base. Abdomen with a pair of blackish spots on each of the first three visible tergites, those on the 2nd and 3rd largest and distinctly triangular, and in the male a narrow central line on all segments which is much less distinct; in the female there are traces of a spot on each side laterad of the submedian spots. Legs black, all tibiæ and basal four segments of fore and mid tarsi yellowish. Wings hyaline. Calyptræ white. Halteres yellow.

Parafacials wider than third antennal segment. Dorsum of thorax with numerous fine hairs, about six irregular series between the presutural dorso-centrals. Abdomen subcylindrical, with rather long apical bristles on sides of basal three tergites and on apex and middle of fourth, the bristles not so long in female. Posterior median bristle on fore tibia weaker in male than in female; upper bristle on posterior side of mid-tibia in male almost on the postero-dorsal surface, the other two more nearly on the postero-ventral, in the female the upper and lower are on the same surface as upper in male and the middle one is on the postero-ventral; hind tibia normal, tarsi as stated in key. Penultimate section of fourth wing-vein about four-fifths as long as ultimate; outer cross-vein at distinctly less than its own length from apex of fifth.

Length 6-7 mm.

Localities. Dunedin, November 18, 1906 (*W. Wesche*); one male and one female, New Zealand (*Clark*); two males, Christchurch, New Zealand, February 17, 1922 (*A. Tonnoir*).

Millerina pennata, sp. n.

Male.—Similar in colour to *limpida*. Differs in particulars noted in the key and as follows: Median thoracic vitta less distinct, no spots on basal abdominal tergite, the submedian pair on tergites 2 and 3 larger, the median line distinct, broad on fourth tergite, and there is a spot on each side of third tergite and a larger one on each side of fourth laterad of the submedian spots. All the bristles on hind side of mid-tibia are short and situated on the postero-dorsal surface, and the ventral surfaces of tibiæ are more densely furnished with microscopic hairs, those on hind pair most noticeable.

Length 7 mm.

Type, New Zealand (*Miller*).

Millerina hudsoni, sp. n.

Male and Female.—Coloured as the preceding species, the median thoracic vitta rather distinct in front of suture.

Abdomen with a pair of spots on first visible tergite, and the outer lateral spots present though faint on apical two or three tergites. Legs tawny, coxæ grey, apical tarsal segment fuscous, femora usually more or less extensively greyish apically. Mesopleura usually with a brownish mark in centre posteriorly.

Chætotaxy of thorax and abdomen as in *pennata*. Fourth segment of fore tarsus of male distinctly but not conspicuously compressed at apex; mid-tarsi simple; mid-tibial bristles in male short, the basal and apical bristles almost postero-dorsal, the median one more nearly postero-ventral. In the male of *pennata* there is a series of fine bristles, which are rather long, on the greater portion of the postero-ventral surface of mid-femur and some similar but longer bristles on middle of the antero-ventral surface, but these are not present in *hudsoni*. The ventral tibial hairs are rather dense, but not so strong as in *pennata*.

Length 6·5–7 mm.

Type, male, Ruapehu, N.Z. (*Fenwick*). Allotype and five male paratypes, Otago, N.Z. (*Hudson*). The last-mentioned series of specimens was sent from the Osten-Sacken collection in the collection of the Deutsches Entom. Institut, Berlin, by Dr. Horn.

Millerina nigrifemur, sp. n.

Male.—Darker in colour than in last species, the spots at base of scutellum covering base, leaving only apical half grey, the triangular submedian abdominal spots on basal three tergites large and black, fourth tergite with two submedian black lines, rudiments of the spots on other segments and with a brown tinge between them, the lateral spots indistinct. Legs black, trochanters, extreme apices of femora, and all tibiæ tawny, tarsi brownish fuscous.

Fourth segment of fore tarsi rather conspicuously compressed on more than its apical half below; mid-femur with a series of short, moderately strong bristles on basal half of postero-ventral surface; mid-tibia as in *hudsoni*; mid-tarsus normal.

Length 5·5 mm.

Type, Ohakune, N.Z., March 8, 1923 (*A. Tonnoir*). Paratype, Greymouth, N.Z. (coll. Osten-Sacken; *Hudson*?).

Idiohelina setifemur, sp. n.

Male.—Similar in colour to *nubeculosa*, Malloch. Differs in having the wings but slightly suffused with brownish apically and costally, the cross-veins not noticeably clouded; the abdomen has the apices of tergites and a central vitta brownish, the two fused so that the markings appear subtriangular on each tergite.

Frons about one-fourth of the head-width; cheek about as high as width of third antennal segment; palpi slender. Femora not abnormal; fore pair with a series of widely spaced postero-ventral bristles which are very long and fine basally and become shorter and stouter apically, the longest about three times as long as diameter of femur; mid-femur with a similar series of shorter and stouter bristles on basal half or more of postero-ventral surface; hind femur without a preapical antero-ventral bristle. Otherwise as *nubeculosa*.

Female.—Differs in having the fore femora with three or four postero-ventral bristles on apical third, and none on mid or hind femora.

Type, male, allotype, and one male paratype, Wanganui, N.Z. (*M. N. Watt*).

Paratype sent to British Museum.

XVI.—*Description of a new Species of the Genus* Desmocræra (Notodontidæ) *from Nyasaland and Rhodesia. By* W. H. T. Tams.

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Desmocræra neavei, Tams, sp. n.

♂. Palpi cartridge-buff, light buff distally, inner side white, black on the upper half above and on outer side. Antennæ honey-yellow, the shaft cartridge-buff. Head with vertex and frons very pale cartridge-buff, sides of frons black round the eyes. Thorax and abdomen dorsally and ventrally very pale cartridge-buff, almost white. Legs pale cartridge-buff; the fore femora above and on outer side fuscous, the fore tibiæ with fuscous hair on outer side; all tarsi with fuscous-black on each segment basally. Fore wing almost white, very pale cartridge-buff along the costa and at the wing-base, the rest of the wing tinged with marguerite-yellow; below the costa sub-basally a black, white, and lemon-yellow spot, the black basad, white in the middle, and yellow terminad; antemedially a similar spot stretching from costa to upper margin of cell, in this case with the yellow basad and the black terminad: a small black dash between costa and base of vein *R* 5; across the cell antemedially a lemon-yellow dash, succeeded by an edging of white scales followed by black scales; an incomplete orbicular ring of raised white scales, open costad and with the lower edge touching the antemedial black scales; a waved lemon-yellow line commencing at lower margin of cell between base and antemedial and running obliquely outward to anal vein, edged close to cell and also to anal vein, terminad, with white followed by black, and succeeded by an incomplete ring of raised scales below the orbicular; antemedially a lemon-yellow dash from anal vein to inner margin, finely edged basad with white and terminad with white succeeded by black; reniform consisting of two prominent rows of raised scales one on each side of discocellulars; postmedial fascia consisting of a series of nine lemon-yellow spots edged basad with black, terminad with white, the first two between veins *R* 4–*R* 5 and *R* 5–*M* 1, half-way between reniform and apex, two lower spots between *M* 1–*M* 2 and *M* 2–*M* 3, set back towards the reniform, the next spot below the middle of vein *M* 3, the sixth below vein *Cu* 1 and set back to a third of that vein, the last three directly below the reniform, one on each side of the anal fold and one between anal vein and inner margin; a fine black festooned subterminal line, dentate terminad on the veins, the two festoons between veins *M* 1–*M* 3 set a little basad and slightly angled instead of bowed; termen cartridge-buff; fringe faintly tinged with marguerite-yellow; the veins appear to be tinged with cartridge-buff, but this may be due to the thin scaling thereon. Hind wing almost white, faintly tinged with marguerite-yellow, the veins and termen appearing cartridge-buff; between costa and vein *Rs*, postmedially, an angled black marking, the apex of the angle basad. Underside whitish, tinged with cartridge-buff, with the costa of the fore wing near apex cream-buff and the termen of both wings cartridge-buff.

Expanse 42 mm. (40 mm. from tip to tip).

♀. Like ♂. Fore wings broader, with costa more strongly bowed.

Expanse 42–46 mm. (40–45 mm. from tip to tip).

Holotype ♂, Nyasaland, Mt. Mlanje, 9. xii. 1913 (*S. A. Neave*).

Allotype ♀, Nyasaland, Mt. Mlanje, 10. xii. 1913 (*S. A. Neave*).

Paratype ♂, Rhodesia, Shamva, Dec. 1920 (*Father J. O'Neil*).

Paratype ♀ ♀, three examples collected by Dr. S. A. Neave in Nyasaland, on Mt. Mlanje, dated 2. v. 1913, 4. xii. 1913, 5. xii. 1913.

In addition to the above material in the British Museum, there are four cocoons from which Dr. Neave bred the type ♂, and three of the ♀ ♀, including the allotype. These are 25–30 mm long, ovaliform, and composed of reddish earthy particles spun together with silk.

I have just received for identification from the Belgian Congo Museum at Tervueren, Brussels, a single male, labelled "Elisabethville, 13. xi. 1923 (*Ch. Seydel*)." This specimen appears to belong to this species, but is much whiter, and may prove to be subspecifically distinct when more material makes it possible to examine the genitalia.

(Colours from Ridgway's 'Color Standards and Color Nomenclature.')

XVII.—*List of the Moths collected in Arabia by Captain R. E. Cheesman, with Descriptions of Four new Species.* By W. H. T. Tams.

(Published by permission of the Trustees of the British Museum.)

[Plate X. figs. 1–4.]

THIS interesting little collection of sixteen specimens from a comparatively unknown region was made by Captain Cheesman in three localities, viz., Hufuf (El Hofuf), Jabrin (Wadi Jabrin), and the Jafura sand-dunes. Jabrin is some 200 miles S.S.W. of Hufuf, whilst the Jafura sand-dunes lie much further to the south of Jabrin. All the species, as might be expected, exhibit the colour-characteristics peculiar to African desert-moths. Four new species in such a small number of specimens from three widely separated localities is a remarkably high percentage, and it may reasonably be expected that further collecting in these regions will produce much interesting desert material. In spite of the smallness of the collection, it contains species occurring in or closely related to species from Egypt, Persia, and N.W. India.

Noctuidæ.

AGROTINÆ.

Agrotis subspinifera, Hmpsn.

Agrotis subspinifera, Hampson, Cat. Lep. Phal. B.M. iv. p. 205, pl. lxi. fig. 19 (1903).

1 ♀, Hufuf, 1. xii. 1923. The ♂ type and another ♂ came from Ferozepore, Punjab, Oct. 1897 (*Nurse*).

Agrotis saracenica, sp. n. (Pl. X. fig. 1.)

♂. Facies of *Agrotis hodna*, Oberthür, but darker in colour. Antennæ serrate-fasciculate, the shaft above with buff scales mixed with some hair-brown scales. Frons in structure like that of *Agrotis segetum*, Schiff., but with the apex of the prominence pear-shaped in outline, the narrow end uppermost. Palpi cream-buff, the basal and second segments shaded on the outer side with fuscous. Head and thorax drab, white and sepia mixed, many of the darker scales white-tipped; tegulæ whiter than rest of thorax. Pectus cartridge-buff. Abdomen above and beneath cartridge-buff, irrorated with drab. Legs cream-buff, the tibiæ with a few drab or hair-brown scales, the tarsi with the larger part of each segment sepia, the tips only being cream-buff. Fore wing ground-colour drab, the veins and pattern fuscous-black, with white splashings on each side of the veins and in and above the orbicular. Claviform marking outlined with fuscous-black, extending along the anal fold to a point opposite to the junction of vein *Cu* 2 with the cell. Orbicular elongate, but not confluent with the reniform; finely outlined with fuscous-black, with a central patch of drab scales surrounded by white and cream-buff scales; reniform large, filling the end of the cell, heavily outlined with fuscous-black and almost filled with fuscous-black; a heavy fuscous-black shade on the costa above the reniform; an obscure fuscous-black band from reniform to inner margin, slightly converging towards termen; a subterminal row of six interneural fuscous-black arrow-head dashes below vein *M* 1, the dash above the anal vein being less well-defined than the others; a patch of fuscous-black shading between veins *M* 1 and *M* 2, from the arrow-head dashes to termen; terminal line thickened interneurally, black; fringe fuscous, with a cream-buff line at base. Ground-colour modified above, in and beyond end of cell, by an admixture of cream-buff scales. Hind wing white, with a fine fuscous terminal line, thickened interneurally; fringe white. Underside almost entirely white; fore wing with costa irrorated with fuscous and fuscous-black; a curved fuscous dash across end of cell; a curved fuscous shade from costa to vein *R* 5 postmedially; a diffuse drab subterminal shade, broader and darker at costa, parallel with termen; terminal line fine, fuscous-black, thickened interneurally; hind wing white, faintly irrorated with drab on the costa, a few fuscous scales above the middle of the discocellulars.

Expanse 40 mm.

Holotype ♂, Jabrin, 200 miles S.S.W. of Hufuf, 21. ii. 1924.

HADENINÆ.

Trichoclea avempacei, Tams, sp. n. (Pl. X. fig. 3.)

♂. Palpi cartridge-buff, sparsely irrorated with fuscous-black. Antennæ bearing bristles and cilia; bristles at middle of antennæ slightly longer than diameter of shaft, length of cilia about two-thirds of length of bristles; upper side of shaft cartridge-buff. Frons prominent, rounded, transversely rugose; clothed with cartridge-buff scales, with a transverse band of fuscous shading at the middle. Vertex of head cartridge-buff, irrorated with fuscous-black. Thorax whitish mixed with cartridge-buff, irrorated with fuscous-black. Pectus cartridge-buff. Abdomen above and beneath cartridge-buff, irrorated with fuscous. Legs cartridge-buff irrorated with fuscous-black, fore tarsi with a narrow band of fuscous-black on the middle of each of the first two segments, the other three segments fuscous-black above; mid-tarsi with the second segment heavily shaded with fuscous-black on the proximal two-thirds, the last three segments almost entirely fuscous-black above; hind tarsi with the third segment shaded with fuscous-black on proximal two-thirds, the fourth and fifth fuscous-black above. Fore wing whitish, tinged with cartridge-buff along the costa, in and beyond the cell, along the lower edge of the cell to the termen, and along the middle of the inner margin, these cartridge-buff-tinged areas sparsely irrorated with clay-coloured scales; the cell-margins irrorated with black and fuscous scales; veins from the cell black, except near the cell; veins *Sc*, *R* 1, and *R* 2 bearing black scales towards their junction with the costa; reniform large, black-outlined except towards the costa, where it is open, filled with an inner reniform patch of fuscous, fuscous-black, and white scales, separated from the black outline by a cartridge-buff-tinged whitish ring; orbicular black-outlined, oval, touching reniform, open basad, containing a patch of grey and drab surrounded by white, the black outline on the lower side continued as a wavy line for a distance slightly greater than the length of the orbicular, with, after a short break, a fuscous line to the wing-base; a broad black streak from wing-base to the lanceolate claviform, which is long, outlined with black, and partially filled with a long narrow patch of fuscous mixed with whitish; a fine black line from apex of claviform along anal fold to termen. A short black dash along the anal vein near the base, another near the termen; a fuscous-irrorated drab patch, in area equal to the reniform, which it adjoins, lying between veins *M* 2 and *Cu* 1; a diffuse greyish shade between veins *R* 4 and *R* 5, not filling the whole interspace; six terminal interneural fuscous-edged black striæ between *R* 5 and the anal vein (*A* 2), the two middle striæ, lying between *M* 2–*M* 3 and *M* 3–*Cu* 1, being the longest, and running into the fuscous-irrorated drab patch adjoining the reniform; fringe alternately cartridge-buff and fuscous-black, the latter interneurally. Hind wing cartridge-buff, suffused with fuscous, lighter at base, becoming darker towards termen; a fuscous dot at middle of discocellulars; fringe cartridge-buff with a few fuscous scales. Underside of fore wing cartridge-buff, irrorated with fuscous-black and black, beyond and below the cell suffused with light brownish-drab irrorated with whitish; a large fuscous-black reniform stigma at end of cell; fringe as on upperside, except for the fuscous-black interneural streaks, which have the basal half cartridge-buff. Underside of hind wing cartridge-buff irrorated with black, the veins towards the termen and the termen itself accentuated with black; fringe cartridge-buff, with a few fuscous scales.

Expanse 29 mm.

Holotype ♂, Hufuf, 23. i. 1924.

CATOCALINÆ.

Callistege albifusa, de Joannis.

Callistege albifusa, de Joannis, Bull. Soc. ent. Egypt. 1900, p. 165.

1 ♀, Hufuf, 29. xi. 1923.

Cossidæ.

Cossus cheesmani, Tams, sp. n. (Pl. X. fig. 2.)

♂. Palpi cartridge-buff, outwardly shaded with fuscous.

Shaft and pectinations of antennæ lightly covered with white scales, barely hiding the olive-brown colour of the chitin beneath. Head, thorax, and abdomen, dorsally and ventrally, cartridge-buff. Legs cartridge-buff; fore femora shaded above with drab, fore tibiæ with three indistinct bands of fuscous irroration—two in the proximal third, the other marking off the distal third; each fore tarsal segment ringed at the middle with olive-brown; mid and hind legs with only the faintest traces of rings on the tarsal segments. Fore wing white, suffused with maize-yellow between costa and upper margin of cell, between end of cell and termen, and, with the exception of a white strip along the anal vein (*A* 2), between the lower margin of the cell (up to vein *Cu* 2) and the inner margin of the wing; markings striate rather than reticulate; clove-brown striæ along the costa, in the end of the cell, and below the cell in the basal third of the wing; remainder of striæ olive-brown; basal half of cell and patches between the postmedial and subterminal striæ and below end of cell not striate; a terminal series of olive-brown spots at the vein-ends, increasing in size from apex of wing to anal vein; fringe white, marked at the veins with faint traces of drab. Hind wing white, the veins but lightly covered with scales; faint traces of striation in the cubital and anal areas; faint olive-brown spots on termen at veins, with traces on fringe. Underside cartridge-buff; fore wing with costal and subterminal striæ evident; hind wing with traces of striæ on costa and in cubital and anal areas.

Expanse 48 mm.

Paratype ♂. Paler in colour of markings; striæ buffy brown to ochraceous-buff, more reticulated and more evenly distributed over fore wing.

Holotype ♂ and paratype ♂, Jabrin, 200 miles S.S.W. of Hufuf, 23. ii. 1924.

This species resembles *Cossus ægyptiaca*, Hmpsn., but differs from it in the following features:—Both fore and hind wings are longer and narrower, markings lighter and showing less reticulation, hind wings almost free from markings, and underside with few striæ.

The description of *Cossus ægyptiaca*, Hmpsn., is most misleading, as it was made from a specimen which had become badly greased. This specimen has been cleaned for comparison with the species here described; but as this is not a suitable opportunity for the redescription of an Egyptian moth, I propose to leave that until I have material sufficiently good to make a satisfactory description possible.

Pyralidæ.

PHYCITINÆ.

Heterographis fulvimarginella, Hmpsn.

Heterographis fulvimarginella, Hmpsn. J. Bomb. Nat. Hist. Soc. xv. p. 23 (1903).

1 ♂, 3 ♀ ♀, Jafura sand-dunes, 26. ii. 1924.

These moths occurred in such numbers that they extinguished Captain Cheesman's lamp.

PYRAUSTINÆ.

Cornifrons ulceratalis, Led.

Cornifrons ulceratalis, Led. Wien. ent. Monat. ii p. 147, pl iv fig. 1 (1858)

1 ♂, 2 ♀ ♀, Hufuf, 29. ii. 1924.

Tegostoma confluentalis, Hmpsn.

Tegostoma confluentalis, Hmpsn. Ann. & Mag. Nat. Hist. (8) xii. p. 299 (1913).

1 ♂, 1 ♀, Jafura sand-dunes, 26. ii. 1924.

Noctuelia avicennæ, Tams, sp. n. (Pl. X. fig. 4.)

♂. Palpi, scaling of antennal shaft, head and thorax tawny-olive. Abdomen olive-buff. Pectus and underside of abdomen drab-grey to pale drab-grey or dirty whitish. Legs tawny-olive above, whitish beneath. Fore wing drab mixed with warm buff, producing a general tawny-olive effect; a fuscous-black medial line, commencing as an acute-angled V (on its side, apex basad), with the tip of its upper arm in the upper angle of the cell and the tip of its lower arm in the lower angle, whence the line takes a sharply oblique slightly curved course basad, enclosing in the angle thus formed a pointed white patch, which merges into the ground-colour basad; an oblique fuscous-black postmedial line, forming three dentations (points terminad) above vein *M* 1, below which it curves basad (convexity terminad) to vein *Cu* 2, turning and diverging slightly from the medial till it reaches vein *A* 2, where it turns sharply terminad, curves round and runs into the inner margin at right angles; the whole line accentuated on the basad side with white, most strongly from the costa to vein *Cu* 2; an indefinite subterminal line from the apex diverging slightly from the termen, becoming lost in a whitish patch at the tornus; between the postmedial and the subterminal a drab shade; a fuscous terminal edging preceded by white; fringe with a row of short fuscous-tipped buff scales, and a row of long white scales mixed with fuscous scales at the ends of the veins. Hind wing light olive-buff with fuscous shading deepening towards the termen; a distinct fuscous subterminal shade, accentuated with fuscous-black at vein *Cu* 2, preceded at this point by a dash of white, and followed by a patch of tawny-olive with a dash of white before the fuscous terminal edging; fringe as in fore wing, but fuscous scales at vein *Cu* 2 only. Underside pale olive-buff; traces of upperside pattern; fore wing with traces of tawny-olive along costa, cartridge-buff between cell and inner margin and also between the oblique lines; cell and subterminal area shaded with drab; a series of whitish dashes on the veins and between them, before the termen; fringe much as on upperside; hind wing with costal margin suffused with cream-buff; traces of fuscous postmedial line; termen and fringe as on upperside.

Expanse 22 mm.

Holotype ♂, Jafura sand-dunes, 26. ii. 1924.

N. avicennæ is very nearly related to *N. albidalis*, Hmpsn., which was described from a somewhat worn female from Fao. The two are alike in size, but the Fao female, which is very pale and seems to have lost many of its markings, may be a faded specimen. The scheme of the pattern resembles that of *N. desertalis*, Hübn., which is, however, a larger moth.

I have named the *Cossus* in honour of Captain Cheesman, who made this collection. The *Trichoclea* I have called after Avempace, a Moslem philosopher who was born at Saragossa and who died at Fez in 1138. The *Noctuelia* I have named after Avicenna, who was famous among the Moslems as a physician and philosopher, who translated the works of Aristotle and influenced scientific thought in Europe during the eleventh century.

EXPLANATION OF PLATE X. FIGS. 1–4.

Fig. 1. *Agrotis saracenica*, Tams, sp. n., ♂.
Fig. 2. *Cossus cheesmani*, Tams, sp. n., ♂.
Fig. 3. *Trichoclea avempacei*, Tams, sp. n., ♂. Enlarged.
Fig. 4. *Noctuelia avicennæ*, Tams, sp. n., ♂. Enlarged.

XVIII.—*List of the Butterflies collected in Arabia by Captain R. E. Cheesman, with a Description of One new Subspecies.*

By N. D. RILEY.

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[Plate X. figs. 5 & 6.]

Nymphalidæ.

Precis orithya cheesmani, subsp. n.
(Pl. X. figs. 5, 6.)

♂ ♀. Nearest to *P. orithya here*, Lang*, but the white postdiscal band of the fore wing above entirely suffused with blue—*i. e.*, the ocellus in area 2 is completely surrounded (but not so strongly on its outer side) by blue, which extends thence to the costa; the costa of fore wing and the marginal areas of both wings, but especially of the hind wing, darker than in *here*. Underside like that of *here*, but much less ochreous, almost pale sooty-grey in general tone, especially the tornal area.

Hufuf, 20. xii. 1923, 1 ♀; 29. xi. 1923, 3 ♂, 2 ♀.

B.M. type no. Rh. 241 ♂, 242 ♀; co-types, 243, 244 ♂, 245, 246 ♀.

Very little variation is visible in the three males; the three females, on the other hand, exhibit a good deal. One specimen has the white fore-wing band hardly at all suffused with blue. The underside of this specimen is like that of the males. In the other two females the underside is of the drier type. In one of them it is almost uniform purplish grey; the other is intermediate.

Precis here was originally described from specimens in the B.M. from Aden and Mesopotamia. The occurrence of this most distinct race in a locality almost exactly intermediate between these two places seems to indicate a degree of isolation in the fauna of Hufuf which would hardly have been suspected.

Papilionidæ.

Papilio machaon, L.

Hufuf, 1 ♂, 20. xi. 1923; 1 ♂, 24. xii. 1923.

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* Entom. xvii. p. 207 (1884).

Papilio demoleus, L.
Hufuf, 2 ♂, 1 ♀, 20. xi. 1923.

The occurrence of *Papilio machaon*, an essentially Palæarctic species, in this locality is a little unexpected. It is, of course, well known from Syria, Palestine, and Mesopotamia; but Hufuf is considerably removed geographically, if not so well separated faunistically, from all these countries. *Papilio demoleus*, on the other hand, was more likely to be met with. Its occurrence, however, considerably extends its known range, the nearest localities from which it had previously been recorded being Persia and Muscat, the latter in the extreme north-east of Arabia.

Pieridæ.

Colias crocea, Fourc.
Hufuf, 1 ♂, 20. xi. 1923.

The same remarks apply to this species as to *Papilio machaon*.

Lycænidæ.

Zizera lysimon, Hb.
Hufuf, 2 ♂, 20. xi. 1923; 1 ♂, 1 ♀, 29. xi. 1923.

Lampides bæticus, L.
Hufuf, 1 ♂, 29. xi. 1923.

Both these "Blues" were to be expected. Both have a very wide distribution throughout the southern Palæarctic and the Indo-Australian regions.

EXPLANATION OF PLATE X. Figs. 5 & 6.

Fig. 5. *Pieris orithya cheesmani*, Riley, subsp. n., ♂.
Fig. 6. Ditto, ♀.

XIX.—*A Comparative Study of the Otoliths of the Neopterygian Fishes.* By G. Allan Frost, F.L.S., F.G.S., F.Z.S.

[Plates XI.-XIII.]

I. Order ISOSPONDYLI.

A comparison of the otoliths of the Isospondyli, the fourth order of the subclass Neopterygii as defined by Mr. C. Tate Regan*, reveals the fact that those of the suborder

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* Proc. Zool Soc. 1923, pt. 2, p. 458.

Clupeoidea exhibit in many cases a primitive simplicity unapproached in other groups, and that we may take these as the basic forms from which the otoliths of later and more specialized fishes have been derived.

A. Suborder CLUPEOIDEA.

Among Clupeoid and Salmonoid fishes, the saccular otolith (the sagitta) is predominant, those of the utriculus and lagena being microscopic and negligible for comparative purposes, except perhaps in *Chanos*, where they are fairly well developed.

The otoliths of the Elopidæ are so similar to those of their Jurassic protypes, the Leptolepidæ, that they confirm in a striking manner Mr. Tate Regan's opinion that these should be placed together as one family.

In *Elops hawaiensis* (Pl. XI. fig. 1) the otolith is long and drop-shaped, the outer side concave, the inner side convex. The dorsal rim is curved and serrated, and slopes anteriorly, meeting the curved ventral rim in front and forming with it a prominent rostrum, there being no antirostrum or notch. There is a slight angle between the dorsal rim and the posterior, which is straight with some serrations. The sulcus occupies the upper half of the rostrum, and is open on the dorsal edge. The ostium is slightly depressed, while the cauda is oblique and narrow, with a rounded termination, and does not reach the posterior rim. There is no angle between the ostium and cauda.

In *Elops saurus* (Pl. XI. fig. 2) the shape is roughly ovate, the outer side concave and inner side convex. The dorsal rim is curved and serrated, and with an anterior angle, below which it runs in a straight line to the front of the rostrum. The ventral rim is keeled with a rounded median angle. The posterior rim, which is curved and serrated, has a slight projection at its junction with the ventral rim, above which it curves upwards to the dorsal. The rostrum is wider than in *Elops hawaiensis*, and there is no antirostrum or notch. The sulcus is widely open on the front of the rostrum, the cauda is wide and gently curved, and terminates some distance from the posterior rim. There is no angle between ostium and cauda.

In *Megalops cyprinoides* (Pl. XI. fig. 3) the rear of the otolith is rounded as in the primitive fossil forms of the Leptolepidæ, the straight wide cauda resembling that of *Otolithus* (*Leptolepidarum*) *simplex* *. The front part, however, differs from these and from the previously described species of the Elopidæ in the concavity of the upper rim of the rostrum, and also in a deep notch immediately above the sulcus, which gives rise to another projection, the antirostrum.

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* Ann. & Mag. Nat. Hist. ser. 9, vol. xiv. p. 189 (1924).

This species affords a very distinct link with the Salmonoids, through *Coregonus williamsonii* (Pl. XII. fig. 1), the otoliths resembling each other in a remarkable degree; but the primitive rounded posterior rim is modified in the latter species.

In the otoliths of *Chirocentrus dorab* (Pl. XI. fig. 4) the curved dorsal and posterior rims are slightly irregular, while there are slight serrations on the curved ventral rim; the rostrum and antirostrum are short, with a well-marked excisura. The sulcus, which is open in front, is expanded and ovate, and is not divided into ostium and cauda. An antirostral groove extends to the rear of the sulcus, which is well removed from the posterior rim.

In *Clupea harengus* (Pl. XI. fig. 5) the front of the otolith resembles that of *Chirocentrus*, but the rear is more produced; an antirostral groove is also present. The sulcus, which also agrees in having no division, is wedge-shaped and extends nearly the full length of the otolith.

In *Clupea sprattus* (Pl. XI. fig. 6) the front of the otolith is occupied by a rectangular gap between the rostrum and antirostrum, whilst the dorsal rim is higher than in *Clupea harengus*, falling away sharply before joining the rounded posterior rim. The sulcus, which is wedge-shaped, extends only to the centre of the otolith.

The otoliths of *Alosa finta* (Pl. XI. fig. 10), while resembling in shape those of *Clupea harengus*, differ in many details. The dorsal rim has two deep indentations posterior to the antirostrum, which becomes a narrow process with an antero-dorsal projection; behind this is a right-angled process slightly inclined forward, the remainder of the dorsal rim being curved. The ventral rim is curved, and there is also a posterior projection as in *Clupea harengus*, but it occurs above the level of the cauda, instead of below as in the latter species. Frontally, below the peculiar antirostrum already described, there is a large rounded excisura; the rostrum is prominent, the dorsal rim being convex. The sulcus is wide and primitive, but with a distinct median angle. The ostium extends to the point of the rostrum which it bisects; the cauda has a wide rounded termination, and does not extend to the posterior rim.

A distinctive feature of the otoliths of the Engraulidæ is a doming of the front of the dorsal rim and a deepening of the rear of the ventral rim, giving an asymmetrical appearance to the otolith.

In *Engraulis mystax* (Pl. XI. fig. 7) the dorsal rim is curved and domed anteriorly, the ventral rim curved and keeled towards the rear. There is a blunt posterior process. Frontally, the rostrum is distinctly Elopine, but there is a deep notch above it and a small pointed antirostrum. The sulcus is divided by an upper and lower angle, and the ostium is longer than the cauda. The upper line of the cauda being domed and the lower line straight, the form is like the outstretched head of a bird, the part representing the beak being hindermost. This peculiar bird-head cauda is found also in the otoliths of *Clupanodon punctatus*, *Albula vulpes*, and *Coilia dussumieri*. The otolith of *Coilia dussumieri* (Pl. XI. fig. 11), another member of the family Engraulidæ, in which the doming of the dorsal rim and the depth of the ventral rim are well shown, differs from that of *Engraulis mystax* in the absence of an excisura and antirostrum, and also in the form of the cauda, which is straight with a rounded termination.

The otoliths of *Clupanodon punctatus* (Pl. XI. fig. 9) and *Anodontostoma chacunda*, both of the Clupeidæ, are singularly alike. In both the dorsal rim is straight with a median depression, the ventral rim curved, and the posterior rounded; frontally they each exhibit a pronounced rostrum and antirostrum, sharp and pointed in the case of *Clupanodon*, but more obtuse in *Anodontostoma*, the excisura in the former also being rather more pronounced than in *Anodontostoma*. In both cases the sulcus is wide, with an upper and lower angle, the ostium being rather longer than the cauda, which is of the bird-head pattern.

The most aberrant form among the otoliths of Clupeoidea is that of *Albula vulpes* (Pl. XI. fig. 8). Ovate in shape, with a rectangular postero-dorsal process, it resembles no other in the order. The dorsal rim, descending in front of the posterior process, rises slightly again before descending anteriorly to meet the ventral rim, which behind is continuous with the curved posterior of the otolith. There is no rostrum or antirostrum. The sulcus opens on the frontal part of the dorsal rim, and curving downwards terminates close to the ventral rim; both upper and lower lines curve upwards and then down towards the middle of the otolith, giving a reversed appearance to the ostium when compared with other species. The cauda has the bird-head form as in *Engraulis mystax* (Pl. XI. fig. 7) and *Clupanodon* (Pl. XI. fig. 9), but is turned downwards at right angles, with the pointed termination close to the ventral rim, the shape of the cauda being the only feature in accord with other otoliths of the Clupeoidea.

The otoliths of this suborder appear to divide themselves into three groups, which may be characterized as follows:—

I. The "**Elopine.**"—Distinguished principally by the prominent rostrum without antirostrum or excisura, and the more or less rounded posterior rim; the sulcus divisible into ostium and cauda, with the ostium depressed and open on upper part of rostrum, and the cauda narrow, longer than the ostium, and with a tendency to curve downwards.

Type-example, *Elops saurus* (Pl. XI. fig. 2).

II. The "**Clupeid.**"—Rostrum, antirostrum, and excisura present; the sulcus wide and open, undivided, or with a slight angle of lower line.

Type-example, *Clupea harengus* (Pl. XI. fig. 5).

III. The "**Engrauline.**"—Prominent rostrum present, but antirostrum and excisura slight or absent; dorsal area high in front, ventral rim deep posteriorly; sulcus with upper and lower angle, cauda with straight lower line, upper line domed or curved.

Type-example, *Engraulis mystax* (Pl. XI. fig. 7).

In certain species a combination of the distinctive features of these types is apparent; thus, in the otoliths of *Clupanodon* and *Anodontostoma* the rounded posterior rim of the "Elopine" form is combined with the "Clupeid" frontal aspect and the "Engrauline" cauda.

In none of these groups does the sulcus cut the posterior rim of the otolith as occurs in some instances in the succeeding suborder, the Salmonoidea, though in *Clupea harengus* there is sometimes a narrow postcaudal groove connecting the sulcus with the rim.

B. Suborder SALMONOIDEA.

The Salmonoidea, which agree with the Clupeoidea in the predominent development of the sagitta, show in their otoliths their relationship to the Elopidæ. The pointed rostrum and general absence of antirostrum and excisura are to be noted. There is a heightening of the dorsal area, however, and the sulcus is straighter, in many cases traversing the entire length of the otolith and opening on the posterior rim, producing a modification of the rear part of the otolith.

In *Coregonus williamsonii* (Pl. XII. fig. 1) the otolith shows a great resemblance to that of *Megalops cyprinoides* (Pl. XI. fig. 3); the upper edge of the rostrum in both forms is concave, and a break in the continuity of the curve of the ventral rim has the effect of depressing the front of the otolith. In *Coregonus* the dorsal rim is flattened, and descends abruptly in front of the junction with the rostrum. There is an elongation of the lower part of the otolith posteriorly, and above this a marked indentation of the posterior rim behind the sulcus. The sulcus consists of a widely open ostium and straight cauda as in *Megalops cyprinoides*, and does not extend to the posterior rim.

In *Thymallus thymallus* (Pl. XII. fig. 3) the otolith is very similar; the dorsal rim is slightly higher anteriorly, the frontal rim rising sharply from the point of the rostrum to join it. There is no break in the curve of the ventral rim, and the rostrum is consequently less depressed than in *Coregonus*. The lower part in the otolith is produced to a point posteriorly, above which is an indentation of the hinder rim immediately behind the cauda. The sulcus corresponds with that of *Coregonus*, but the cauda is expanded, with a wide termination which may extend to the posterior rim.

In *Salmo salar* (Pl. XII. fig. 2) the front and lower part of the otolith are very similar to the foregoing species, but the sulcus opening on the posterior rim divides the otolith into an upper and a lower part. The upper part is truncated and only half the length of the lower, which forms projections anteriorly and posteriorly. The sulcus is less expanded than in *Thymallus*, the ostium occupying only a third of the rostrum, and the cauda lying open along the dorsal rim of the posterior extension.

In *Salmo trutta* (Pl. XII. figs. 4 & 5) two forms are shown, fig. 4 being the otolith of a river-trout and fig. 5 that of a sea-trout. Closely resembling that of *Thymallus* in contour, a median heightening of the dorsal rim has a shortening effect on the general appearance of the otoliths, while in the sea-trout there is a concavity of the ventral rim below the rostrum.

In *Oncorynchus quinnat* (Pl. XII. fig. 8) the form of the otolith is much distorted. The dorsal rim is highly domed, the upper part of the otolith being much shorter than the lower; the frontal rim is irregular, with a slight excisura and antirostrum. The ostial portion of the rostrum is widely expanded dorsally and anteriorly and the front truncated. There is a deep indentation of the ventral rim below the ostium. The lower part of the posterior rim projects beyond the upper, but in a lesser degree than in *Salmo salar*. The upper and lower edges of the sulcus meet in the centre of the otolith, the ostium being very widely open on the frontal rim, while the cauda opens above the lower posterior extension. Exhibiting the same features as *Salmo salar*, these are throughout coarser, and in some cases so distorted that at first glance the salmonoid nature of the otolith is hardly apparent.

In *Osmerus eperlanus* (Pl. XII. fig. 7) the dorsal rim has a median indentation, and is domed posteriorly; the ventral rim is angular towards the middle, and curves anteriorly to the dorsal edge of the rostrum. The posterior rim is rounded, with an indentation above the cauda. Frontally there is a rounded rostrum, and a slight antirostrum with excisura. The sulcus is wide, the ostium depressed and opening on the dorsal rim of the rostrum, a narrow margin intervening between it and the rounded frontal rim. The cauda, which is wide and slightly curved, opens on the posterior rim. There is a distinct advance in this form towards those observable in later groups, notably the Berycoids.

In the deep-sea salmonoid, *Argentina sphyræna* (Pl. XII. fig. 6), the otolith is deep and pentangular. The dorsal rim is straight, and curves frontally to the top of the rostrum, and terminates in an angle where it joins the posterior rim. The ventral rim is keeled, with a median angle, from which it rises to the point of the rostrum. The posterior rim is slightly curved and nearly vertical. The front of the otolith agrees with other salmonoids. The sulcus presents the primitive and straight form of the Elopine type; there is a slight angle of the lower line, and the rounded termination does not reach the posterior rim.

This otolith resembles in contour a fossil form from the Jurassic, *Otolithus* (*Leptolepidarum*) *pentangulatus*, and also approaches that of *Osteoglossum bicirrhosum* (Pl. XII. fig. 9). It leads to the more specialized form displayed in the otoliths of the Stomiatioid fish *Gonostoma denudatum* (Pl. XII. fig. 12).

The otolith of *Haplochiton zebra* (Pl. XIII. fig. 12) shows some slight affinity with those of the other salmonoids in the shape of the sulcus, but otherwise the shape is indeterminate and uninteresting.

C. Suborders OSTEOGLOSSOIDEA, STOMIATIOIDEA, etc.

In *Osteoglossum bicirrhosum* (Pl. XII. fig. 9) the otolith is pentangular in shape, in this respect resembling the fossil form *Otolithus* (*Leptolepidarum*) *pentangulatus* and that of *Argentina sphyræna*. The dorsal rim, however, is more domed and descending posteriorly is productive of a lessened hinder rim. The ventral rim is angular and the front of the rostrum obtuse; there is no antirostrum or notch. The sulcus is straight, with the ostium slightly depressed and the cauda straight, and bulging at its termination does not reach the posterior rim. The front part of this otolith resembles that of *Salmo trutta*, while the peculiar formation of the rear part and the excessive bulge of the cauda are reproduced in the otoliths of *Hyperopisus bebe* of the Mormyridæ.

Another member of the Osteoglossoidea, *Heterotis niloticus* (Pl. XII. fig. 10), presents a different form of otolith to that last described. More Elopine in character, the shape is wedge-like, and in outline not unlike that of *Elops hawaiensis*. The dorsal rim is angular, the dorsal area being reduced to a narrow margin above the cauda. The ventral rim is angular, and the posterior rim small and rounded. The rostrum comprises the entire anterior half of the otolith, and there is no antirostrum or excisura. There is a narrow præostial margin to the rostrum entirely enclosing the front of the sulcus, an exceptional feature in the Isospondyli, that in *Osmerus* only extending to the dorsal edge, which remains open. The sulcus is widest at the junction of the ostium and cauda, and descends anteriorly and posteriorly from this point, the ostium narrowing and terminating close to the end of the rostrum, and the cauda, which is rather smaller, ending close to the posterior rim.

The otoliths of *Gonostoma denudatum* (Pl. XII. fig. 12), of the suborder Stomiatoidea, resemble in their general lines those of *Argentina*, but are more highly specialized in some respects, the rostrum being more produced, and the sulcus considerably modified. The dorsal rim is rounded and highest posteriorly. The ventral rim is rounded and slightly concave below the extended rostrum. The posterior rim is rounded, and there is an indentation below the dorsal rim. The rostrum is long and narrow, the dorsal edge being straight with some serrations; there is a blunt antirostrum and slight excisura. The sulcus is straight and undivided, anteriorly it occupies the upper part of the rostrum and is open on the dorsal edge and the extreme rostral point, posteriorly it becomes shallow and disappears into an area surrounded by a line which, commencing below the cauda, runs upward and forward to the front of the otolith. The rostrum of this otolith is more produced than in any other species of the order Isospondyli, and is only approached in length by the styliform process which represents the rostrum in the Notopteridæ.

In *Notopterus kapırat* (Pl. XII. fig. 11) the otolith is asymmetrical and biconvex. The dorsal rim, elevated in front, and the ventral depressed posteriorly, gives the same tilt to the otolith as observed in those of the Engraulidæ Frontally the otolith is rounded and bulges forward; below this a peculiar styliform process represents the rostrum, while level with it a very slight depression is the only indication of the sulcus.

This form is undoubtedly due to degeneration from a type similar to that of *Gonostoma denudatum*; the ventral rim, the poise of the rostral process, and the line of the sulcal depression, all agreeing with the corresponding features of that species; a divergent point is the anterior elevation of the dorsal rim, as in the Engraulidæ, and the unusual bulging of the frontal rim.

Although placed among the Isospondyli, the Mormyridæ show very little affinity as regards the otoliths with any other family in the order. In the other families the saccular otolith (the sagitta) is predominant, but in the Mormyridæ in many cases this is the least developed, the asteriscus being in some instances by far the larger otolith, and the lapillus as large or larger than the sagitta, while in other species the lapillus is larger than the asteriscus. In some genera the relative importance of the three otoliths appears to be the same as in certain of the Ostariophysi, the otoliths of *Mormyrus caschive* presenting the same relations in size to one another as those of *Hoplias trahira* and of certain Cyprinidæ.

In *Mormyrus caschive* the asteriscus (Pl. XIII. fig. 2) is enlarged and thickened, the lapillus (Pl. XIII fig. 5) being about one-sixth of its size, and the sagitta even smaller and ill-formed.

Gymnarchus niloticus (Pl. XIII. fig. 1) has the asteriscus enormously developed and lodged in a lateral cavity of the cranium, opening in front into the fossa below the temporal bone. It differs from the lagenar otoliths of other fishes in its extreme thickness, which is equal to about half its width; the outer side has a central depression, with curved radiating furrows extending from it to the outer rim; there is an anterior process corresponding to the rostrum of a saccular otolith, which is extended laterally in an outward direction and has a well-marked notch above it. The inner side presents a rough surface showing some concentric lines, and a deep curved sulcus, with strong ridges above and below.

In *Genyomormyrus donnyi* (Pl. XIII. fig. 4) the lapillus is well developed on the same lines as in those Siluroids in which this otolith is the largest.

In *Gnathonemus elephas* (Pl. XIII. fig. 7) the lapillus is the largest otolith, the asteriscus (Pl. XIII. fig. 3) being slightly smaller; the outer edge of the latter is serrated and there is a well-marked excisura as in *Gymnarchus niloticus*.

In those species in which the sagitta is sufficiently developed to show the form of the sulcus, this is undivided and opens on the front of the otolith; in *Hyperopisus bebe* (Pl. XIII. fig. 8), in which this occurs, the dorsal rim is straight with the posterior rim at right angles to it, whilst the ventral rim is keeled and deepest in front. The frontal opening of the sulcus is below the projecting dorsal rim, and is very narrow, widening out behind, the termination, which is close to the posterior rim, being enlarged and rounded; the form of the rear of the otolith and the termination of the cauda are unusual, and greatly resemble those of *Osteoglossum bicirrhosum* (Pl. XII. fig. 9).

In another sagitta, *Mormyrus* sp. (Pl. XIII. fig. 9, the constriction of the frontal opening of the sulcus is the same, but the termination of the cauda is not so enlarged or rounded, while in the sagitta of *Mormyrus kannume* (Pl. XIII. fig. 10) the sulcus, instead of being constricted, is widely open on the front of the otolith and narrows towards the termination, the reverse of the two previously described forms.

Pl. XIII. fig. 11 shows the otoliths of *Gonorynchus greyi*, of the family Gonorynchidæ, in which the sulcus is narrowest in front as in *Hyperopisus* and *Mormyrus* sp. (Pl. XIII.

fig. 9); the general form of the otolith, however, is Elopine and has little in common with the Mormyridæ.

In conclusion, the only hint of a relationship existing between the Mormyridæ and the other families of the Isospondyli, as far as the evidence of the otoliths goes, is the resemblance of the cauda and rear of the sagitta of *Hyperopisus bebe* (Pl. XIII. fig. 8) to that of the otolith of *Osteoglossum bicirrhosum* (Pl. XII. fig. 9). This point, though of interest, seems useless by itself, and, apart from any other features in which they may differ, a comparison of the otoliths suggests that the Mormyridæ represent a highly specialized group, and that, as far as the otoliths are concerned, they have little in common with the remainder of the Isospondyli.

EXPLANATION OF THE PLATES.

PLATE XI.

Fig. 1. *Elops hawaiensis*, × 3.
Fig. 2. *Elops saurus*, × 5.
Fig. 3. *Megalops cyprinoides*, × 1½.
Fig. 4. *Chirocentrus dorab*, × 5.
Fig. 5. *Clupea harengus*, × 5½.
Fig. 6. *Clupea sprattus*, × 8.
Fig. 7. *Engraulis mystax*, × 5.
Fig. 8. *Albula vulpes*, × 3½.
Fig. 9. *Clupanodon punctatus*, × 4½.
Fig. 10. *Alosa finta*, × 4.
Fig. 11. *Coilia dussumieri*, × 5½.
Fig. 12. *Anodontostoma chacunda*, × 1.

PLATE XII.

Fig. 1. *Coregonus williamsonii*, × 5.
Fig. 2. *Salmo salar*, × 4½.
Fig. 3. *Thymallus thymallus*, × 5.
Fig. 4. *Salmo trutta* (sea-trout), × 4.
Fig. 5. *Salmo trutta* (river-trout), × 4.
Fig. 6. *Argentina sphyræna*, × 5.
Fig. 7. *Osmerus eperlanus*, × 5½.
Fig. 8. *Oncorynchus quinnat*, × 4½.
Fig. 9. *Osteoglossum bicirrhosum*, × 2.
Fig. 10. *Heterotis niloticus*, × 2½.
Fig. 11. *Notopterus kapirat*, × 5.
Fig. 12. *Gonostoma denudatum*, × 6.

PLATE XIII.

Fig. 1. *Gymnarchus niloticus* (asteriscus), × 1½.
Fig. 2. *Mormyrus caschive* (asteriscus), × 8½.

Fig. 3. *Gnathonemus elephas* (asteriscus), × 5.
Fig. 4. *Genyomormyrus donnyi* (lapillus), × 5
Fig. 5. *Mormyrus caschive* (lapillus), × 5.
Fig. 6. *Petrocephalus bane* (lapillus), × 4.
Fig. 7. *Gnathonemus elephas* (lapillus), × 5
Fig. 8. *Hyperopisus bebe* (sagitta), × 5
Fig. 9. *Mormyrus* sp (sagitta), × 5.
Fig. 10. *Mormyrus kannume* (sagitta), × 4½.
Fig. 11. *Gonorynchus greyi* (sagitta), × 4½.
Fig. 12. *Haplochiton zebra* (sagitta), × 5.

XX.—*Additional Notes on the Heteroptera of Rodriguez.* By W. E. CHINA, B.A.

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THE following revisional notes have been published on the advice of Dr. E. Bergroth, and embody the results of his criticism (submitted to me in correspondence) of my paper on the Hemiptera-Heteroptera of Rodriguez *. My sincere thanks are due to Dr. Bergroth for his kindly and unfailing help on all occasions.

13. *Neuroctenus gulliveri*, China.

Mezira gulliveri, China, Ann. & Mag. Nat. Hist. (9) xiv. p. 430 (1924).

The posterior margin of the fifth ventrite in the ♀ is bisinuate and the two median genital lobes of the sixth ventrite are subquadrate. According to Bergroth these characters are typical of *Neuroctenus*, and are never found in *Mezira*. He says that some species of *Neuroctenus* have a rather convex venter. In the present species the venter is distinctly convex.

26. *Lachnesthus rodriguezensis*, sp. n.

Lanchnophorus guttulatus, China, nec Reuter, Ann. & Mag. Nat. Hist. (9) xiv. p. 485 (1924).

In my paper I used the original spelling—*Lanchnophorus*. Bergroth (Journ. Bombay Nat. Hist. Soc. 1915, p. 173) maintains that this is a mere lapsus for *Lachnophorus*, and as the latter name is preoccupied he has proposed the new name *Lachnesthus*. I had overlooked the fact that Distant (Rhynch. Brit. Ind. ii. p. 69) has synonymized *L. guttulatus*, Reuter, with *Rhyparochromus singalensis*, Dohrn, apparently basing his synonymy on a specimen compared by Bergroth with Reuter's type at Helsingfors. If this synonymy is correct, the Rodriguez species is evidently new, and I append the following description:—

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* Ann. & Mag. Nat. Hist. ser. 9, vol. xiv. p. 427 (1924).

♀. Black, the head, pronotum, and scutellum covered with long erect hairs; posterior lobe of pronotum fuscous, the three basal joints of the rostrum, the lateral margins of the pronotum, the acetabulæ, and the basal tarsal joints pale castaneous. Corium fuscous, with a small spot on the costal margin a little posterior of the middle, a much smaller dot towards the middle of the claval suture, another similar small dot towards the inner angle, and the extreme apex, whitish; membrane fuscous, a curved nervure in the inner angle, surrounding a small dot, a spot at the apex of the corium, and a double spot towards the tip whitish. Length of antennal joints, commencing with the first, 0·34, 0·68, 0·53, and 0·86 mm. Rostrum extending slightly beyond the intermediate coxæ.

Total length 5·1 mm.

This agrees very well with Reuter's description of *L. guttulatus*, but differs from the specimens of *L. singalensis*, Dohrn, as determined by Distant, in the smaller size, the absence of pale markings on the basal half of the hemelytra, and in the much smaller pale costal fascia. The antennæ are also rather shorter.

35. *Peregrinator* (*Microcleptes*) *biannulipes*, Sign.

Opiscœtus biannulipes, Sign. Ann. Soc. Ent. France, 1861, p. 69.
Microcleptes biannulipes, Stål, Kongl. Svensk. Vet.-Ak. Handl. xii. no. 1, p. 79 (1874).
Reduvius laniger, Butler, Ann. & Mag. Nat. Hist. (4) xvii. p. 411 (1876).

Recorded from Central America, Cuba, Réunion, Philippines, New Caledonia, Fiji, etc.

Distant had placed Butler's type of *R. laniger* under *Allæocranum*, Reuter, but, according to Bergroth, *Allæocranum* is generically quite distinct from *Microcleptes*, Stål, and so we must use Kirkaldy's new name *Peregrinator*.

42. *Rodriguaria scotti*, China.

Chætocapsus scotti, China, *loc. cit* p. 442.

Bergroth considers that this species was wrongly referred to *Chætocapsus*, Popp., and believes that it represents a new genus, which I therefore propose to call *Rodriguaria*.

RODRIGUARIA, gen. nov.

The majority of generic characters were given under the specific description of *C. scotti*, China, so that it is only necessary to mention here the chief differences between *Rodriguaria* and *Chætocapsus*, Popp.

Body less elongate, dull, with the hemelytra shining. Basal joint of antennæ strongly incrassate, armed with a few bristle-like hairs; remaining joints slender, more or less uniform in thickness, and tapering gradually towards the apex, covered with fine, short, depressed hairs, second joint without bristles. Sides of pronotum slightly sinuate behind the middle, the posterior margin less deeply emarginate. Brachypterous.

Genotype, *Chætocapsus scotti*, China.

In my figure of *C. scotti* the posterior lateral angles of the pronotum are represented as being very acute. This is an error, the angles being actually rounded off slightly external to the basal angles of the scutellum. This makes the base of the pronotum slightly narrower and the sides straighter; the outer edges of the posterior angles in the figure really represent the basal parts of the costal margins of the hemelytra.

Rodriguaria resembles *Chætocapsus* in having the front acetabulæ prominent and distinctly visible from above, projecting beyond the sides of the pronotum just below the apical collar. This character is not shown in my figure, which was drawn under the binocular at a higher focus for the sake of clearness.

These corrections and descriptions do not alter the total number of species recorded from Rodriguez, but increase the number of new species to fourteen and the number of new genera to three.

BIBLIOGRAPHICAL NOTICE.

A Monograph of the Birds of Prey. By H. KIRKE SWANN, F.Z.S., M.B.O.U. Illustrated by H. Gronvold. Pp. 52, illustrations 5. Published by Wheldon & Wesley Ltd., 2, 3, & 4, Arthur Street, W.C. 2.

IN undertaking so great a work as a Monograph on the Birds of Prey, Mr. Kirke Swann has attempted a task which, though so much needed, is one which has hitherto frightened other Ornithologists from writing. Prior to this Monograph, no modern book has been written embracing the whole of the fascinating order of Accipitres—which name we are glad to see the Author retains,—with the exception of the two editions of the Synopsis brought out by the same author. An immense amount of work has, however, been recently done in this group by Mr. W. L. Sclater, whose articles have been published from time to time in the 'Ibis' or the 'Bulletin of the British Ornithologists' Club.' Dr. E. Hartert has also, of course, dealt with the Palæarctic Accipitres with his usual thoroughness in his wonderful volumes on Palæarctic Birds. The work of both these gentlemen has been constantly made use of and acknowledged by Mr. Kirke Swann.

As regards the classification, which is dealt with at length in the Preface, we find no startling innovations. The author accepts 692 species and subspecies, which he divides into 100 genera. These genera are grouped into four families: (1) the Cathartidæ or New World Vultures; (2) the Ægypidæ, or Old World Vultures; (3) the Sagittariidæ, or Secretary-Birds; and (4) the Falconidæ, which contains the Eagles, Kites, Buzzards, and Hawks or Falcons. This last family he again divides into eight subfamilies, placing Pandion, the widespread Osprey, in a family isolated by itself and far from its nearest relations, Eagles of the genera *Haliaëtus* and *Polioaëtus*, which also have a more or less reversible outer toe.

On the whole, the author has been fairly conservative with his genera, though there are a few which some ornithologists might consider superfluous. On the other hand, the great majority will agree with him in separating *Astur* from *Accipiter*. These two genera combined make a most unwieldy group and, as classification is only an aid to science, unworkable groups which create unnecessary difficulties for the student are always to be deprecated, just as much as is the needless splitting of small genera on trivial grounds.

Perhaps the only point on which we cannot agree with the author in his classification is his attempt to introduce the term "form" in supercession of the now universally accepted "subspecies." This latter term surely means "something less than a definable species," and "form" expresses this meaning not one whit better.

The letterpress includes keys to the families and genera, as also to the species, a complete synonomy, a fairly brief, yet sufficient, description of the plumage of adults and young in their various stages, a full record of distribution and, finally, field-notes. These latter are, perhaps the poorest part of the letterpress. True, in a work of this magnitude, such notes must be practically all culled from other works, but we think in some cases more modern writers might have been consulted and quoted with advantage.

We notice the author still thinks that vultures are assisted, to some extent, in finding their food by smell—an opinion he could hardly retain had he lived many years in tropical countries, where bodies of animals may lie undiscovered by the vultures, scenting the country all round, provided only that they are concealed sufficiently from view.

Every author who writes a book knows that, immediately he does so, many critics will at once produce information on his subject which they have, until then, kept very carefully to themselves, for it is so much easier to correct others' work than to work oneself. Again, every scientific author knows that his work is but a stepping-stone to someone else's work. If his own work is an advance on the last, he should rest satisfied. Mr. Kirke Swann may, we think, congratulate himself on having carried out a scientific achievement none the less valuable because everyone will not agree with all that he says and because there is still much left for others to do. We, his readers, may also congratulate ourselves on having an excellent monograph on the Accipitres which will save us much weary research in the future and which should stimulate us to add yet something more to the great mass of facts which he has presented to us in so interesting and so scientific a manner.

The illustrations are as excellent as we expect from an artist of such high standing as Mr. Gronvold, whilst letterpress and general get-up of the work are worthy of its valuable contents.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 25th, 1924.—Dr. J. W. Evans, C.B.E., F.R.S., President, in the Chair.

The following communication was read:—

'The River-Deposits of the Lower Valley of the Warwickshire Avon.' By Miss Mabel Elizabeth Tomlinson, B.A., M.Sc., F.G.S.; with an Appendix by Alfred Santer Kennard, A.L.S., F.G.S., & Bernard Barham Woodward, F.L.S., F.G.S.

Fluviatile sands and gravels occur as river-terraces in the lower valley of the Warwickshire Avon, between Stratford and Tewkesbury. The surfaces of these terraces lie on curves parallel to the present thalweg of the Avon. Five such terraces have been identified:—

No. 5 Terrace, about 140 to 150 feet above the river.
No. 4 Terrace about 80 to 90 feet above the river.
No. 3 Terrace about 40 to 50 feet above the river.
No. 2 Terrace about 30 to 40 feet above the river.
No. 1 Terrace not more than 10 feet above the river.

The heights refer to the surface of the river-terraces, for the following reason:—Deep excavations of the valley, followed by big infillings, have taken place at least twice in the history of the Avon Valley.

In the case of No. 5 and No. 4 Terraces, the deposits vary in thickness from 5 to 50 feet, according to whether the remnant of so big an infilling has been preserved towards the side or towards the centre of the ancient valley. No. 5 Terrace has yielded no contemporaneous fossils.

No. 4 and No. 3 Terraces both contain a warm fauna, with *Hippopotamus* and *Belgrandia marginata* occurring solely at No. 3 level, and *Corbicula fluminalis* at No. 4 level. The Author considers that No 4 and No. 3 Terraces probably belong to the same period of aggradation, that No. 3 Terrace represents the early, and No. 4 Terrace the late stage in this aggradation, and that the terrace-like tops seen in some of No. 3 Terrace deposits were formed during a pause in the subsequent excavation of the valley through this big infilling.

No. 2 Terrace contains a cold fauna, with numerous remains of Mammoth and *Rhinoceros tichorhinus*.

No. 1 Terrace probably underlies the alluvium, and may be connected with the infilling of the buried channel which has been identified at Fladbury and Tewkesbury.

The sole evidence of human industry found in these deposits, up to the present, is a fresh flint of Mousterian type from No. 2 Terrace

In the paper an attempt is made to reconstruct the history of the cutting of the valley of the Avon and to compare the results with those obtained in the Cam[1] and the Somme Valleys.[2]

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[1] J. E. Marr, 'The Pleistocene Deposits around Cambridge' Q. J. G. S. vol. lxxv (1919–20) p. 204

[2] L. de Lamothe, 'Les Anciennes Nappes Alluviales & Lignes de Rivage du Bassin de la Somme & leurs Rapports avec celles de la Méditerranée Occidentale' Bull. Soc. Géol. France, ser. 4, vol. xviii (1918) p. 3.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 86. FEBRUARY 1925.

XXI.—*A Bajocian-Bathonian Outcrop in the Jordan Valley, and its Molluscan Remains.* By LESLIE R. COX, B.A., F.G.S., Department of Geology, British Museum.

(Published by permission of the Trustees of the British Museum.)

[Plate XIV.]

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INTRODUCTION.

The kindness of the members of the expedition referred to in my previous paper (1924) enables me to announce the important discovery of an outcrop of highly fossiliferous rocks of Middle Jurassic age in the Jordan Valley. The exposure is situated at the mouth of Wadi Jabbok (or W. Zerka), where this valleys opens out into the Jordan Plain. This spot cannot be far from the site of Penuel, the scene of the old Jewish tradition of Jacob's vision. The discovery is of importance as being the first authentic record of Jurassic rocks in the Jordan Valley region, or anywhere between Northern Sinai and Mount Hermon, in Syria.

It is of interest to recall the observations made by previous explorers at the same locality. Lartet (1869, map, and 1877, p. 36) recorded the occurrence of Nubian Sandstone here, and evidently found no Jurassic fossils. In 1905 two Americans (Libbey and Hoskins) published an account of a journey in this district, with a palæontological appendix by G. van Ingen (vol. ii. pp. 357–8). The latter described from Wadi Jabbok two echinoids, *Cidaris glandaria* and *C. glandaria*, var. *claviphœnix*. He followed the older authors in assigning a Cretaceous age to these fossils, although by the time he wrote it had been proved by several authors that these species are really Upper Jurassic in age. The question interested Blanckenhorn (see 1912, p. 305), who had also seen a specimen of an Upper Jurassic brachiopod, *Rhynchonella moravica*, Uhlig, collected by Wetzstein, once German Consul at Damascus, and localized as "near Zerka." In 1908 he visited the locality with the object of ascertaining definitely whether Jurassic rocks were exposed in the wadi (see account, 1912, pp. 318–324). He records the occurrence of a small mineral spring just inside the mouth of the wadi, near the left bank; near this spring, he states, the steep side of the wadi is formed by an alternation of beds of yellowish-grey calcareous sandstone with soft, clayey, sandy shales or sandy, gypsiferous clay. In one of the harder beds he found a fragment of an oyster-shell. Riding up the wadi, he looked for traces of Jurassic rocks in the pebbly bed of the stream, but "von Juraformation zeigte sich keine Spur." Accordingly, he suggests (1912, p. 306) that the Upper Jurassic fossils of Libbey and Hoskins and of Wetzstein had been wrongly localized, owing to a confusion of labels, or else had been purchased from an Arab dealer at Chau Hatrura, with incorrect information.

It is surprising that Blanckenhorn could find no trace of Jura in Wadi Jabbok, as the steep sides of the wadi, only a few yards from the spring he mentions, contain abundant fossils of obviously Jurassic age. The most interesting fact, however, is that the fauna of these beds is of Bajocian-Bathonian age. Although no trace of the Upper Jurassic was found by the present expedition, it seems probable that beds of this age also crop out somewhere in the neighbourhood.

The mode of occurrence of the Jurassic rocks is much the same as that of the Triassic beds referred to in my previous paper, namely, as a fossiliferous intercalation in the "Nubian Sandstone." The matrix of the fossils is an impure yellowish limestone of various degrees of hardness. A bed of oolitic ironstone occurs at one horizon.

Numerically, brachiopods form by far the most abundant element of the fauna. Lamellibranchs, gastropods (internal casts), echinoids, badly-preserved corals, and a *Serpula* comprise the remainder of the fossils collected. Among the lamellibranchs and brachiopods occur several species with a wide geographical distribution (e. g., *Homomya gibbosa, Mytilus asper, Eudesia cardium,* "*Rhynchonella concinna,*" *R. quadriplicata*). The first four are a typical Bathonian assemblage, but the presence of the last indicates that the Bajocian stage is also represented.

Until fairly recently the only Jurassic exposures known anywhere in the Anatolia-Syria-Egypt region were those at Lebanon and Mount Hermon, in Syria. The fauna of these has been described in the monographs of Noetling (1887) and Krumbeck (1905). The best-known fossil-horizons are Corallian or Kimmeridgian, the Middle Jurassic substratum having been but little investigated.

During the last few years, however, the explorations of Couyat-Barthoux, P. Range, and the officers of the Egyptian Geological Survey have led to the discovery of an important series of Jurassic rocks in the Maghara Range of Northern

Sinai (see Couyat-Barthoux and Douvillé, 1913, Range, 1921, Hume, et al., 1921). The fossils collected by the first two have been described respectively by Douvillé (1916) and by Hoppe (1922). The late R. Fourtau was preparing a monograph on the material collected by the Egyptian Survey at the time of his death.

The Wadi Jabbok fauna resembles very closely that found at the Bajocian–Bathonian horizon in the Maghara Range. Many of the same species, notably the interesting lamellibranch *Heligmus asiaticus*, occur at both localities. The composition of the fauna—namely, the abundance of brachiopods, lamellibranchs, and echinoids, and the scarcity of ammonites—is again much the same at both localities. There is, in fact, little doubt that the Jordan Valley beds were once in direct continuity with those of Northern Sinai.

The nearest exposures in Northern Africa are situated to the east, in Abyssinia (Douvillé, 1886), and the west, in Tunis (Douvillé, 1908). In both these regions a similar facies is found. Evidently, as Hoppe (1922) points out, we are dealing with the deposits of the southern shallow-water zone of the Eurasiatic province. The majority of the species found at Jebel Maghara are well-known European species, although, according to Douvillé, two or three are to be identified with Indian forms.

PALÆONTOLOGY.

The present paper deals only with the molluscan remains, the Brachiopoda being described by Miss H. Muir Wood in the paper which follows. All the fossils described have been presented to the Geological Department of the British Museum, and are referred to by their registration-numbers.

LAMELLIBRANCHIA.

Family **Ostreidæ**.

Genus OSTREA, Linné, 1758.

Ostrea jabbokensis, sp. n. (Pl. XIV. figs. 1 *a*, *b*.)

Diagnosis.—Left valve oval, strongly inflated; umbo obscure, situated and twisted anteriorly; attachment-area very small; shell-surface ornamented with 16–20 costæ, radiating from the umbo and curving posteriorly, non-dichotomising, rounded in cross-section, producing a crenulated margin. Ligament-area very small and narrow, almost obscured by umbonal twist.

(Right valve unknown.)

Holotype.—L. 37660; a left valve, and the only specimen known.

Dimensions.—Length 18·5 mm.; height 13·5 mm.; inflation 9·2 mm.

Remarks.—The holotype is regarded as a left valve because it is inflated considerably, and has a small area of fixation at the umbo. In small, inflated, costate oysters (e. g., *O. knorri*, Voltz, and *O. costata*, Sow., both Middle Jurassic forms), the left valve is usually deep and inflated, while the right valve is flat and lid-like. One species, however, is known with almost equally convex valves (*O. vergonjeatensis*, Riche, 1893, Ann. Univ. Lyon, vi. (3) p. 98, pl. i. figs. 19–20, from the Bajocian of the French Jura). If the present specimen is a left valve, the anterior twist of the umbo is a remarkable feature for an oyster. The normal condition, observable at the extreme apex of most oysters, where this has been preserved, and much intensified in the genus *Exogyra*, is for the umbo to be twisted posteriorly.

The general form of the present specimen, with its anterior, prosogyrate umbo, is reminiscent of the genus *Cardita*. It is rather difficult to assign the species to any group of previously-known forms. *O. costata*, for example, although similarly inflated, has a very large area of attachment, while its costæ diverge more or less symmetrically from a central line, just as in the section *Arctostrea*, to which it shows some approach. *O. knorri* has rounded, less prominent, but more numerous costæ than *O. costata*, but resembles the latter in its large attachment-area and sub-symmetrical mode of growth. The present species has no affinity with the section *Arctostrea*, and in its very small attachment-area, twisted umbo, very asymmetrical form, and regular, non-dichotomous costæ, certainly differs from all previously-known species.

Ostrea israelis, sp. n. (Pl. XIV. figs. 2 *a*, *b*, *c*.)

Diagnosis.—Shell elongate, lunate, curving posteriorly; fairly inflated, sub-equivalve. Umbo bordered anteriorly by slight aliform projection; attachment-area small, slightly posterior to umbo. Anterior margin folded into 6–7 widely-spaced, deep, sharp plications, corresponding to costæ branching off from an imaginary line running down centre of shell; costæ almost absent on posterior half of shell-surface, which falls away fairly abruptly to the sharp posterior margin; posterior margin unplicated, except at extreme ventral end.

Holotype.—L. 37661; the only specimen known.

Dimensions.—"Length" (umbo to extreme ventral end) 22 mm.; maximum width 9·3 mm.; inflation 7·7 mm.

Horizon.—Bajocian (in same block as *Rhynchonella quadriplicata*).

Remarks.—This species belongs to a group of costate oysters, abundant from Callovian times onward. The group comprises species more or less elongate in form, and usually curving posteriorly so as to be lunate. The costæ of each valve diverge to the anterior and posterior margins from a line which passes from the umbo approximately along the middle of the shell. The margins are strongly and sharply crenulated, the inner (posterior) margin usually to a smaller extent than the anterior. Pervinquière (1912, 'Études Pal. Tunisie,' ii. p. 203) places the oysters of this group into the section for which he proposes the name *Arctostrea*, reserving the name *Lopha* (synonyms *Alectryonia*, *Rastellum*, *Dendrostrea*) for the broad, more or less flat, plicated forms such as *O. marshi*, Sow. A list of Middle Jurassic species of this group is given by Rollier (1911, 'Les Faciès du Dogger,' p. 274), who erroneously applies the name *Rastellum* to the section.

Of this group, the present species resembles most closely the Callovian form *O. rustica*, Defrance (figured by A. Bigot, 1893, Bull. Lab. Caen, ii. p. 134, pl. ii. figs. 1–3, and 1904, 'Pal. Universalis,' pl. lxxii.). In *O. rustica*, however, the shell is wider, relatively more inflated, with well-developed costæ on the posterior half of the shell. The species *O. avita*, H. Douvillé (1916, 'Massif du Maghara,' p. 57, pl. vi. fig. 7), from the Bathonian of N. Sinai, is similar in size and relative elongation, but its costæ are more numerous and less prominent. They are well developed on the posterior half of the shell. The aliform expansion posterior to the umbo, conspicuous in *O. avita*, is not developed in *O. israelis*.

I cannot agree with Douvillé in considering the specimen from the Callovian of Cutch, figured as *O. carinata* by J. de C. Sowerby (1837, Geol. Trans. (2) v. pl. xxii. fig. 8) to be a representative of the species *O. avita*. Sowerby's original specimen is now in the British Museum (Geol. Soc. Coll.

9963). It is relatively much wider, with a large attachment-area, from which its costæ, often dichotomous, diverge. Nor can I agree with Bigot in assigning it to *O. rustica.* Of European Jurassic forms it is closest to *O. gregaria*, but should, I think, be given a new name.

Family **Vulsellidæ.**

Genus HELIGMUS*, E. Eudes-Deslongchamps, 1856.

(Refs.: E. Eudes-Deslongch., 1856, Mém. Soc. Linn. Normandie, x. p. 272; 1856, Bull. Soc. Linn. Normandie, i. p. 104. E. Munier-Chalmas, 1863, Bull. Soc. Linn. Normandie, viii. p. 13. H. Douvillé, 1907, Annales de Pal. ii. (3) p. 8.)

This genus, known only from rocks of Middle Jurassic age, comprises small, not very inflated, approximately equivalve, plicated, oyster-like bivalves, which are readily distinguished from representatives of the genus *Ostrea* (*a*) by the nacreous character of the shell, (*b*) by the absence of any surface of fixation on the left valve, (*c*) by the gaping of the shell-margins posterior to the umbones, (*d*) by the presence of a prominent internal platform for the attachment of the adductor muscle. The type-species, *H. polytypus*, Eudes-Deslongch., is a rather rare form found in the Bathonian of France, Switzerland, Galicia, etc. The notching of its widely-gaping margins just behind the umbones is very peculiar. Such notching, however, is not a feature of generic significance. In *H. rollandi*, Douvillé, it is quite absent, and the gaping of the margins is only slight.

Dall (1913, Eastman's editn. of Zittel's 'Textbook of Palæontology,' p. 451) follows T. N. Gill (1871, Smithsonian Miscell. Coll. ccxxvii. p. 22) in assigning this genus to a distinct family, the Heligmidæ. Douvillé has, however, advanced good reasons for placing it in the Vulsellidæ.

Heligmus asiaticus, Douvillé (emend.).

(Pl. XIV. figs. 3 *a, b, c*, 4, 5, & 6.)

Heligmus rollandi, race *asiatica*, Douvillé, 1916, Massif du Moghara, p. 59, pl. vi. figs. 13–17.

Heligmus lævis, Douvillé, 1916, *ibid.* p. 60, pl. vi. figs. 18 19.*

Diagnosis.—Shell very variable; circular, oval, or subtriangular in contour, only slightly inflated. In some specimens ornamented on its anterior-central surface with radial, at times bifurcating, costæ; in other specimens almost unornamented. Growth-striæ well marked on remainder of surface. Posterior gaping of margins very slight.

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* Originally published as "*Eligmus*," but emended to *Heligmus* by P. Fischer, 1887, on etymological grounds.

Dimensions.—Up to about 45 mm. in diameter.

Remarks.—This peculiar species seems to be abundant at Wadi Jabbok, as well as in the Maghara Range, where its horizon is definitely Bathonian. It can hardly be regarded as a "race" of *H. rollandi*, Douvillé, a species hitherto recorded only from one locality, in France. In *H. rollandi* the radial costæ are always well marked and extend over nearly the whole shell-surface. In *H. asiaticus* they never occupy more than a portion of the surface and are frequently almost obsolete, although in all specimens I have examined there is some indication of them. Every transition is shown from specimens in which the costæ are well developed (*e.g.*, L. 37662, Pl. XIV. fig. 3) to specimens which are almost unornamented (*e.g.*, L. 37665, Pl. XIV. fig. 6). Hence I cannot agree with Douvillé in distinguishing the latter as a separate species—*H. lævis*. I have not been able to examine the interior of any valves of *H. asiaticus*, but Douvillé has demonstrated the presence of the characteristic raised platform for the adductor muscle. The posterior gaping of the shell-margins is only very slight.

Family **Mytilidæ**.

Genus Mytilus, Linné, 1758.

Mytilus asper, J. Sowerby, sp.

Modiola aspera, J. Sow., 1818, Min. Conch. iii. p. 21, pl. ccxii. fig. 4.
Mytilus asper, Mor. & Lyc., 1853, Great Ool. Mollusca, ii. p. 39, pl. iv. fig. 8.
Mytilus (*Septifer*) *asper*, Laube, 1867, Br. Jura Balin, p. 30, pl. ii. fig. 5.
Modiola aspera, Douvillé, 1886, Fossiles du Choa, p. 228, pl. xii. fig. 11.

This well-known Bathonian fossil is represented by two rather badly-preserved specimens (L. 37670–1), about the identification of which, however, I have no doubts. The species is widely distributed in the European Bathonian, and has been recorded by Douvillé from beds of this age in Abyssinia.

Family **Trigoniidæ**.

Genus Trigonia, Bruguière, 1789.

Trigonia sp. (Pl. XIV. fig. 7.)

This genus is represented by two small internal casts

(L. 37672–3), obviously the same species, but not determinable.

Dimensions.—Length 17·5 mm.; height 17 mm.

Family **Cardiidæ.**

Genus CARDIUM, Linné, 1758.

Cardium sp.

This genus also is represented by an undeterminable internal cast (L. 37674).

Dimensions.—Length 32 mm.; height 27 mm.

Family **Pholadomyidæ.**

Genus PHOLADOMYA, G. B. Sowerby, 1823.

Subgenus HOMOMYA, Agassiz, 1843.

Authors have differed considerably in their interpretation of the various genera founded by Agassiz in his 'Monographie des Myes.' This confusión is partly due to difficulties in ascertaining the hinge-structure of many species, which are frequently represented only by internal casts; and partly to differences in opinion as to which species are to be considered typical of his several genera. The latter problem can only be solved by a definite designation of genotypes.

Agassiz's *Homomya* has given rise to much confusion. Thus Stoliczka (1870, 'Cret. Pelecypoda S. India,' p. 68) states that there is great difficulty in distinguishing the genus from "*Myacites*," as diagnosed by him. Fischer (1887, 'Manuel de Conch.' p. 1166) states that the species referred by Agassiz to *Homomya* revert either to *Pleuromya* or to *Arcomya*.

In his original diagnosis of *Homomya*, Agassiz states that it is meant to include species differing from *Pholadomya* "par un caractère essentiel, l'absence de côtes transversales." The genus *Pholadomya* was originally diagnosed by G. B. Sowerby (1823, 'Genera of Shells,' pt. 19) by reference to the then newly-discovered Recent species, *P. candida*, G. B. Sow. This species has been definitely designated as genotype of *Pholadomya* (P. Fischer, 1887, 'Man. de Conch.' p. 1179). Of the species placed by Agassiz in the genus *Homomya* it is necessary to select as genotype one to which Agassiz's definiton undoubtedly applies. I therefore designate as genotype of *Homomya* the species figured by Agassiz (pl. xviii. figs. 4, 5, non 1–3) as *Homomya gibbosa* (Sow.). According to some authors this species is not identical with Sowerby's *Mactra gibbosa*, but rather with *Homomya vezelayi* (Lajoye, sub *Pholadomya*). There can be no doubt, however, that these are closely allied species of the same group. The hinge-structure of *H. gibbosa*, Agassiz, has been investigated most thoroughly by Terquem (1855, Mém. Acad. Metz, p. 287), who concludes that it does not differ from that of the genus *Pholadomya* in any important character.

The species of the group of *H. gibbosa* have been considered by some authors (*e.g.*, Terquem, *loc. cit.*) to be inseparable from *Pholadomya*. Agassiz, however, has pointed out that in a group of thin-shelled species the presence or absence of radial costæ is an important feature. Morris and Lycett (1863, Suppl. 'Great Oolite Mollusca,' p. 89) decide that the name *Homomya* may be conveniently retained to include species such as *H. gibbosa*. They point out, however, that in well-preserved examples of this group a few delicate radial lines are usually to be observed upon the umbones, so that *Homomya* can rank only as a section or subgenus of *Pholadomya*. Rollier (1911, 'Faciès du Dogger,' p. 242), who gives a list of Dogger species of the group of *H. gibbosa*, defines *Homomya* as "*Procardia* (Meek em. Rollier) sans côtes." *Procardia* is applied by Rollier to the group of *Pholadomya* relatively high in form, with a well-defined escutcheon.

Zittel (1885, 'Handb. Palæontologie,' p. 124) regards *Homomya* as a subgenus of *Pholadomya*, but diagnoses it to have a much wider embrace than does Rollier, and to include certain species referred by Agassiz to *Arcomya* and *Myopsis*. Until a thorough revision of the genera of the family Pholadomyidæ can be undertaken and the hinge-structure of many species described, it is best, with Rollier, to restrict the name to the group of *H. gibbosa*, and to consider it as a subgenus of *Pholadomya*.

Pholadomya (*Homomya*) *gibbosa*, J. Sow., sp., var. nov. *asiatica*. (Pl. XIV. figs. 8 *a*, *b*.)

Diagnosis.—A variety of *P.* (*H.*) *gibbosa* (J. Sow., sub *Mactra*) differing from the typical form in being relatively less elongated and more inflated, in tapering to a greater extent posteriorly, and in not projecting anteriorly to the umbones.

Holotype.—L. 37675.

Paratype.—L. 37676.

Dimensions of Holotype.—Length 103 mm.; height 65 mm.; inflation 60 mm.

Remarks.—Sowerby's original figure of *Mactra gibbosa* is not very good and his type is, unfortunately, lost. His specimen came from near Bath, its horizon being stated to be Great Oolite in the text, but Inferior Oolite in the Systematic Index. It is seen to be elongated, tapering only slightly posteriorly, with a considerable projection anterior to the umbones. There is no furrow descending ventrally from the umbo. Specimens referable to this typical variety are fairly abundant in the Cornbrash; they differ considerably from one another in their relative elongation, but in other respects are very much alike. As Rollier (1911, 'Faciès du Dogger,' p. 244) remarks, the specimen figured by Morris and Lycett (1853, 'Great Oolite Moll.' pl. xi. fig. 5) as *Myacites vezelayi* is a typical representative of *P.* (*H.*) *gibbosa*, while the specimen figured as *Homomya gibbosa*, Sow., sp., in pl. xliii. fig. 2 of the Supplement to the same work is certainly not the typical variety, but very similar to the variety figured by Agassiz (' Ess. Myes,' pl. xviii. figs. 4–5) as *Homomya gibbosa*, which Morris and Lycett say is distinct from Sowerby's species.

Rollier (*loc. cit.*) has discussed the various forms of *Homomya gibbosa* and allied species found in the European Dogger, but is rather inclined to increase the list of species unnecessarily. He is, at any rate, quite in error in imagining that definite varieties are restricted to definite horizons.

I have compared the present variety with all forms described from the European Dogger, and find it to be distinct, although having close affinity to *P.* (*H.*) *gibbosa*. As in the typical variety of this species, there is no furrow descending ventrally from the umbo. The new variety is more inflated and compact than both the typical variety and the variety figured by Martin (1863, Mém. Acad. Dijon, (2) x. pl. ii.), to which Rollier has given the new name *P.* (*H.*) *martini*. The most inflated region is only slightly posterior to the umbones. The wide, rounded anterior end, scarcely salient past the umbones, again distinguishes it from the typical variety and, much more, from *P.* (*H.*) *vezelayi*, Lajoye (figd. Martin, *loc. cit.* pl. i.). Finally, the relative shortness and posterior tapering, due to the rapid curving upward of the ventral margins, again serve to distinguish the present form as a definite variety. It is not, I think, sufficiently distinct to be advanced to specific rank.

Unfortunately, in the two specimens available for study the shell is not preserved near the umbones, so that the presence or absence of any indications of radial ribbing cannot be observed. The flanks of the shell are quite unornamented, except by growth-striæ. At their posterior extremities the shells are broken away, so that the actual form of the posterior gape cannot be ascertained.

Douvillé (1916, 'Massif du Moghara,' p. 55, pl. iv. fig. 5) figures a specimen of Bathonian age, which, although smaller, seems to have affinities with the present form. Douvillé, I think, is quite in error in assigning this specimen to the species *Pholadomya inornata*, J. de C. Sowerby, from the Callovian of Cutch. This latter, of which the type (Geol. Soc. Coll. 9947), a badly-preserved specimen, distorted by pressure, lies before me, is a small, ovoid species, tapering only slightly posteriorly, and reaching its greatest inflation at about the centre of the valves. Traces of radial ribbing are seen on the umbones. Better-preserved specimens need to be figured. Moesch records the species from the Callovian of France (1874, 'Monogr. Pholadomyen,' p. 53), but does not give figures. The dimensions he quotes are much larger than those of the type.

Pholadomya inornata, Douvillé, non Sow., in its lateral aspect very closely resembles *P.* (*H.*) *gibbosa*, var. *asiatica*, although the umbo is somewhat more pointed and prominent, and slightly less anterior. The inflation is, unfortunately, not indicated. Mention is made of a very few faint radiating costæ upon the umbo. Such traces of costæ are known to exist on well-preserved specimens of *P.* (*H.*) *gibbosa*. It is, therefore, possible that Douville's specimen may prove to be a representative of the new variety *asiatica*.

GASTROPODA.

The family Aporrhaidæ is represented by one badly-preserved specimen, a portion of an internal cast (G. 35490, Pl. XIV. fig 9), possibly referable to the genus *Chenopus*. The specimen is not good enough for description.

A second specimen (G. 35492), also an internal cast, is an indeterminable representative of the genus *Natica*, sensu lato.

EXPLANATION OF PLATE XIV.

(With the exception of fig. 8, all figures are of natural size.)

Fig. 1. *Ostrea jabbokensis*, sp. n., L. 37060. (*a*) left valve, viewed from above; (*b*) the same, showing dorsal margin and inflation.

Fig. 2. *Ostrea israelis*, sp. n., L. 37061. (*a*) left valve; (*b*) anterior margin; (*c*) right valve.

Fig. 3. *Heligmus asiaticus*, Douvillé. Well-plicated specimen, L. 37662. (*a*) left valve; (*b*) dorsal margin, posterior end to the right; (*c*) right valve.

Fig. 4. *Heligmus asiaticus*, Douvillé, L. 37664. Largest specimen, view of left (?) valve.

Fig. 5. *Heligmus asiaticus*, Douvillé, L. 37663. Elongated specimen, view of left (?) valve.

Fig. 6. *Heligmus asiaticus*, Douvillé, L. 37665. Specimen with only slight traces of radial costæ. View of right (?) valve.

Fig. 7. *Trigonia* sp., L. 37672.

Fig. 8. *Homomya gibbosa* (J. Sow.), var. *asiatica*, var. nov., L. 37675. (× ½.) (*a*) dorsal aspect; (*b*) right valve.

Fig. 9. Gastropod, gen. (*Chenopus* ?) and sp. indet., G. 35490.

XXII.—*Jurassic Brachiopoda from the Jordan Valley.*

By Helen M. Muir Wood, M.Sc., F.G.S.

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[Plate XV.]

The Brachiopoda described in this paper form part of an interesting collection of fossils from the Jordan Valley recently presented to the Natural History Museum. The specimens were obtained from the mouth of Wadi Zerka, the valley of the River Jabbok, a tributary of the Jordan on its east bank, about 20 miles north of the Dead Sea.

The beds from which these specimens were obtained are of Upper Bajocian and Bathonian age.

The Brachiopoda from the Upper Bajocian beds consisted of the following species:—

Cymatorhynchia (?) *quadriplicata* (Hartmann).
Lobothyris ventricosa (Davidson), non Hartmann.
? *Heimia jabbokensis*, sp. n.

In the Bathonian beds the following species occurred:—

Eudesia cardium (Lamarck).
Burmirhynchia tumida, Buckman (= *Rhynchonella concinna*, Davidson, non Sowerby).
Heimia furcitiensis (Haas).
Avonothyris jordanensis, sp. n.

There is no evidence of the occurrence of Oxfordian-Kimeridgian beds, although such are to be expected in this neighbourhood.

An account of the former explorations in this area and a description of the molluscan remains contained in the present collection are given by Mr. L. R. Cox in the preceding paper.

DESCRIPTION OF SPECIES.

Family **Rhynchonellidæ.**

Genus CYMATORHYNCHIA, S. S. Buckman, 1914, Genera of some Jurassic Brachiopoda, p. 2.

Defined in Palæontologia Indica, n. s. iii. no. 2, p. 53.

"Hypothyrid (beak short, foramen circular, deltidial plates conjunct); multiplicate, dental plates strong and divergent; ventral muscle-area well marked, large, elongately trigoniform; dorsal septum strong, fairly long; dorsal muscle-scars well marked, forming two elongate-trigonal figures; ovarian areas large, not quite half of valves; vascular system shows numerous approximate shallow channels in the cast" (*S. S. B.*).

Cymatorhynchia (?) *quadriplicata* (Hartmann). (Pl. XV. figs. 8 *a–c*.)

Rhynchonella quadriplicata, Hartmann in Zieten, 1832, Versteinerungen Wurtemburgs, pl. xli. fig. 3.

See also: —Davidson, 1855, Mon. Brit. Foss. Brach. i., Appendix, pl. A, fig. 22.

Deslongchamps, 1855, Bull. Soc. Linn. Normandie, ii. p. 362, pl. v. fig. 5.

Quenstedt, 1858, Der Jura, p 423, pl. lvii. fig. 6.

Quenstedt, 1868, Petrefactenk. Deutschlands, Brach. pp. 81, 82, t. xxxviii. fig. 42.

Davidson. 1878, Mon. Brit. Foss. Brach. iv. pt. ii. no. 2, p. 201, pl. xxix. figs. 1–3.

Rollier, 1917, Mém. Soc. Pal. Suisse, xlii. p. 148.

Hoppe, 1922, Zeitschr. Deutsch. Palästina-Vereins, xlv. p. 78.

Diagnosis.—Costation coarse and angular, fold and sinus well developed. Brachial valve with four costæ on fold and five on each lateral slope, pedicle-valve with three costæ in sinus and six on each lateral slope. Umbo tapering and incurved. Foramen circular, deltidial plates conjunct. Dental plates long, stout, and slightly divergent. Brachial valve with median septum extending for one-third of length of valve.

Material.—Twenty-four specimens in a fair state of preservation. None showed internal characters. [B. 45377–93, 45398–99.]

Horizon.—Bajocian.

Description.—The number of costæ developed in each valve is a very constant character, unlike the German specimens, where there is enormous variation both in the size and number of the costæ. Hoppe (1922) noted the slight variation in the specimens of this species, collected from the Bajocian beds of Sinai. It was not possible to obtain internal casts by the method of burning, and the generic relationship of the Palestine form is uncertain. The shape and position of the dental plates resemble those of *Cymatorhynchia*. Buckman assigns the German specimens with doubt to his genus *Cymatorhynchia*.

Dimensions of figured specimen.—Maximum height 21 mm.; max. width 23 mm.; max. thickness 18 mm. or 1 : 1·09 : 0·85.

Remarks.—Hartmann (in Zieten) originally described this species from the Upper Inferior Oolite near Gosheim and at Harras, Germany. Quenstedt (1868) figured a typical specimen from the "Braun Jura δ." Davidson (1855) figured a similar form from the Inferior Oolite of Cheltenham. D'Orbigny (1850, 'Prodrome,' i. pp. 314 & 343) quoted *R. quadriplicata* from the Bathonian and Callovian of France, but Deslongchamps (1857), having examined Zieten's original specimen and compared it with French specimens, stated that this species does not occur above the Inferior Oolite. Hoppe (1922) recorded it from the Bajocian of el-Mlēh, Sinai.

Genus Burmirhynchia, Buckman, 1915, Rec. Geol. Surv. Ind. xlv. p. 76.

Def. 1917, Palæontologia Indica, n. s. iii. p. 49.

"Hypothyrid (beak massive, springing from a gibbous umbo, apex produced and incurving [foramen subelliptical, deltidial plates narrow, disjunct]); slightly trilobed; multiplicate; dental plates strong, much divergent, ventral muscle-area large, pyriform, dorsal septum strong; dorsal muscle-area quadriform to subcircular pattern—the two anterior scars strongly marked, making a cordate figure, being individually more or less pyriform, bounded by well-marked diverging channels" (*S. S. B.*).

Burmirhynchia tumida, Buckman. (Pl. XV. figs. 7 *a*, *b*.)

Rhynchonella concinna, Sowerby; Davidson, 1852, Mon. Brit. Foss. Brach. i. pt. iii. no. 2, p. 88, pl. xvii. figs. 6 *a*, *b*.

Terebratula concinna, Sowerby; Quenstedt, 1868, Petrefactenk. Deutschlands, Brach. pl. xxxviii. fig. 36.

Rhynchonella concinna, Sowerby; Szajnocha, 1879, Denk. K. Ak. Wiss. Wien, xli. (2) pl. vi. figs. 10, 11.

Burmirhynchia tumida, Buckman, 1917, Palæontologia Indica, n. s. iii. no. 2, p. 221, pl. xvii. figs. 6 *a*-*c*.

Diagnosis.—Outline trigonal. Brachial valve very globose; pedicle-valve flattened. Umbo massive; apex acute and incurved, hypothyrid. Foramen oval; deltidial plates disjunct. Brachial valve with broad, slightly raised, median fold, ornamented with eight costæ; nine costæ on each lateral slope. Pedicle-valve with median portion slightly depressed, but no true sinus, and twenty-seven costæ at the anterior margin.

Interior shows a short median septum in the brachial valve. Dental plates strong and divergent. Other internal characters unknown.

Material.—One specimen showing external ornament. Dental plates and median septum seen through test. [B. 45301.]

Horizon.—Bathonian.

Dimensions of figured specimen.—Maximum height 23 mm.; max. width 24 mm.; max. thickness 19·5 mm. or 1 : 1·04 : 0·84.

Remarks.—Davidson (1852) described and figured this species from the Great Oolite of Cirencester. Buckman (1917) figured it from the Great Oolite of Fritwell, near Aynhoe, Northants, and stated that its age was post-*subcontractum* and pre-*bathonica*. Quenstedt's specimen was obtained from the Braun Jura δ of Krakau, while Szajnocha figured a similar form from the Balin Oolite of similar age.

Burmirhynchia tumida, Buckman (=*Rhynchonella concinna*, Davidson, in part.), differs from *Rhynchonella* [*Kallirhynchia*] *concinna*, Sowerby, in having a flattened instead of a deeply sinuated pedicle-valve, therefore in having a greater thickness than *K. concinna*. The umbo in *Kallirhynchia concinna* is more erect and less massive than in *Burmirhynchia tumida*. The arrangement of the muscle-scars in the two forms is quite distinct. It is probable that specimens from adjacent areas recorded as "*Rhynchonella concinna*" resemble the Palestine specimen of *B. tumida*.

Fraas (1877, N. Jahrb. Mineral. pp. 22, 29) mentions this species from the Jurassic (Upper Brown Jura) of Mount Hermon, but compares it to Quenstedt's figure (1868), which was quoted by Buckman in his synonymy of *B. tumida*; it also resembles the Palestine species very closely.

The specimen of *Rhynchonella concinna* figured by Douvillé (1916, Mém. Acad. Sci. Paris, liv. pl. i. fig. 21) from the Bathonian of the Moghara Massif is more elongated and appears to have a less-marked fold in the brachial valve, the anterior margin is not abruptly truncated as in *B. tumida*.

Family **Terebratulidæ.**

Genus AVONOTHYRIS, Buckman, 1917.

Palæontologia Indica, iii. no. 2, p. 102.

"Epithyrid (beak rather small, rather short, subcarinate, foramen small, circular, marginate, symphytium rather narrow, fairly well exposed); test finely punctate, with signs of capillation in old age; sulcation of dorsal umbo occasional, but not persistent down valve in biplicates; morphogeny sulcate, to rectimarginate trigonal, to paraplicate, with subsequent elongation; muscle-tracks fairly long, sub-approximate."

Avonothyris jordanensis, sp. n.

Diagnosis. — Outline roughly circular, with the length slightly in excess of the width. Beak-ridges obscure, epithyrid. Beak short and incurved, concealing the fused deltidial plates or symphytium in the adult stage. Foramen circular to oval and labiate. Widest part of shell occurs a short distance above anterior margin. Brachial valve concave near umbo, but becoming very globose. Pedicle-valve convex. Anterior margin irregularly flexuous, but plication of valves never prominent. Shell-surface smooth, with numerous growth-lines. Anterior portion of shell capillate. Interior of brachial valve with strong median septum separating the narrow, slightly diverging posterior adductor scars. Two small oval muscle-scars are distinguishable near their anterior extrémities, set close to the median septum. Ovarian markings distinguishable on the posterior lateral portions of this valve. Pedicle-valve with long narrow diductors enclosing oval adductor scars.

Holotype [B. 45302]. Paratypes [B. 45303, 45307].

Material.—Twenty-four specimens with shells preserved in beekite [B. 45306–27]. One specimen [B. 45307], an internal cast, showed muscle-scars of both valves.

Horizon.—Bathonian.

Description.—Growth-stages: brachial valve sulcate in early stages, with slight corresponding carination in the pedicle-valve; sulcation is more persistent and is traceable for 1½ centimetres below the umbo. The valves then flatten and develop a trigonal outline with plane commissure. A broad rounded fold is developed on each side of the median flattened portion, which, again, gradually becomes sulcate, giving rise to a biplicate anterior margin. The amount of plication in the brachial valve is very variable, and in some specimens folding commences at an early stage.

Dimensions of figured specimens (Pl. XV.).—

	Fig. 1.	Fig. 2.
	mm.	mm.
Maximum length	45·5	40·5
„ width . . .	39·5	26·5
„ thickness ..	32	28
or	1:0·86:0·70	1:0·90:0·69

Remarks.—The characters of this species agree very closely with those of the genus *Avonothyris* of Buckman. This genus was proposed for a number of British Bathonian species from Bradford-on-Avon, many of them dwarfs. These species resemble *A. jordanensis* very closely in external form and posterior sulcation of the brachial valve. Young forms of *A. jordanensis* are very similar to *A. trigonata*, Buckman (1917, *loc. cit.* pl. xxi. figs. 10 *a–c*). *A. corpulenta*, Buckman, shows a considerable resemblance to *A. jordanensis*; the anterior margin, however, is more excavated and the umbo less incurved in the British species. The external shell-surface resembles that of *Avonothyris*; the anterior capillation is also characteristic and the growth-stages are similar. In shape and position of the muscle-scars *A. jordanensis* resembles the genus *Holcothyris*, Buckman. This genus was proposed for a number of Indian species, and resembles *Avonothyris* very closely. In *Holcothyris*, however, the whole shell is capillate and the dorsal sulcus is continuous to the anterior margin. The small anterior adductors developed in *A. jordanensis* resemble those of *Holcothyris*. No second pair of adductors is shown in any specimen of *Avonothyris*. This may be due to the bad state of preservation of the British material, for in other characters *A. jordanensis* is in complete accord with the genus *Avonothyris*. A variety of *Terebratula quillyensis*, Bayle, figured by Douvillé (1916, Mém. Acad. Sci. Paris, liv. pl. vii. fig. 5), resembles *A. jordanensis* slightly in outline, but the folding is more prominent and the growth-stages of the two forms are distinct. *A. jordanensis* resembles in shape and contour *Terebratula retrocarinata*, Rothpletz (1886, 'Palæontographica,' xxxiii. pl. ii. figs. 3 *a*, *b*), from the Brown Jura *δ–ε*. The folding and growth-stages of the two forms are distinct and the adductor scars are broader and longer in *T. retrocarinata*. *A. jordanensis* is distinguished from *Epithyris maxillata* (Sow.) by its shorter less incurved umbo, greater elongation of shell, and difference of internal characters.

Genus Heimia, Haas, 1890.

Abh. d. Schweiz. pal. Ges. xvii. p. 87.

"Hypothyrid (beak short, stout, foramen rounded, symphytium hidden); morphogeny sulcate to plano-perconvex to sulciplicate (? paraplicate); [muscle-tracks narrow, approximate almost parallel]" (*S. S. Buckman*, 1917, p. 103).

Heimia furciliensis (Haas). (Pl. XV. figs. 6 *a–c*.)

Terebratula furciliensis, Haas, 1890, Abh. d. Schweiz. pal. Ges. xvii. p. 95, pl. x. figs. 1-4.

Terebratula stephani, Dav., var. *furciliensis*, Haas; Clerc, 1904, Mém. Soc. Pal. Suisse, xxxi. p. 80, pl. iii. figs. 4 *a–c*.

Heimia furciliensis, Haas; S. S. Buckman, 1917, Palæontologia Indica, n. s. iii. no. 2, p. 103 (list only).

Terebratula furciliensis, Haas; Rollier, 1918, Mém. Soc. Pal. Suisse, xliii. p. 225.

Diagnosis.—Outline elongate-oval, with length of shell in excess of width. Brachial valve depressed; pedicle-valve highly convex. Beak short, incurved, and concealing the fused deltidial plates or symphytium. Beak-ridges not developed. Umbonal slopes meeting at apex in angle of 72°. Shell smooth, with numerous growth-lines. Internal characters unknown.

Horizon.—Bathonian.

Description.—Growth-stages: the brachial valve is sulcate near the umbo, and corresponding carination is developed in the pedicle-valve. Flattening of the brachial valve next occurs, with increasing convexity of the pedicle-valve. Both valves are now circular in outline, with a plane commissure. Biplication of the brachial valve follows directly on this stage, the folds increasing in width and prominence anteriorly, and a median sulcus is formed between the folds. A deep sinus is also developed on the outer side of each fold, thereby adding to its elevation. A median fold is developed in the pedicle-valve corresponding to the median sinus of the brachial valve.

Dimensions of figured specimen.—Maximum length 30 mm.; max. width 24 mm.; max. thickness 17·5 mm. or 1 : 0·8 : 0 58.

Remarks.—This species was described by Haas from the Bathonian of Furcil, near Noiraigue, Val de Travers, in the Swiss Juras. Rollier quotes it as being of Bradfordian age. The Palestine specimens agree in shape and dimensions with Haas's figures and with actual specimens of *Terebratula furciliensis*. The incurvature of the umbo so as to conceal the symphytium, absence of beak-ridges, the flattening of the brachial valve, convexity of the pedicle-valve, and anterior biplication are characteristics of this species and of the genus *Heimia*. The folding in the Palestine specimens is slightly less prominent than in the Swiss examples. Haas places his species in the "Globata group," and compares it with *Terebratula ferryi* from the Inferior Oolite, figured by Davidson (1878, Mon. Brit. Foss. Brach. iv. p. 139, pl. xvii. fig. 8). This species is narrower in proportion to its length, and is said by Buckman (1917, p. 116) to belong to the genus *Sphæroidothyris*, while *Terebratula furciliensis*, from its external characters only, is said to belong to the genus *Heimia*. Rollier (1918, p. 225) compared this species with *Terebratula circumdata*, Deslongchamps, from which he considered it to be derived. From this species, however, *Heimia furciliensis* is distinguished by its different growth-stages.

Heimia jabbokensis, sp. n. (Pl. XV. figs. 5 *a–c*.)

Diagnosis.—Outline elongate-oval, with length considerably greater than width. Greatest width of shell occurs at a point midway along the length. Brachial valve flattened; pedicle-valve convex. Beak short, slightly incurved, and in contact with brachial valve, not projecting beyond hinge. Beak-ridges very faint. Umbonal slopes meeting at apex in angle of 108°. Shell smooth. Adductor muscle-scars of brachial valve short, narrow, and subparallel. Cardinal process low, narrow, and posteriorly excavated.

Holotype [B. 45304].

Material.—Thirty-three specimens well preserved and showing external characters. One imperfect specimen showed cardinal process and part of loop [B. 45439] [B. 45304, 45328–60].

Horizon.—Bajocian or Bathonian?

Description.—Growth-stages: the brachial valve is sulcate near the umbo and the pedicle-valve slightly carinate. The brachial valve then flattens and the pedicle-valve becomes convex. Elongation follows on this circular plano-convex stage, and biplication is developed in the brachial valve. The folds are raised up on each side of the median flattened portion and become very prominent anteriorly. A strong median fold is developed anteriorly in the pedicle-valve and a shallow sulcus is formed on each side of the fold.

Dimensions of figured specimen.—Maximum length 35·5 mm.; max. width 27 mm.; max. thickness 21·5 mm. or 1 : 0·7 : 0·6.

Remarks.—This species is distinguished from *Heimia furciliensis* by its larger dimensions, greater width and convexity of the brachial valve, shorter and less incurved beak, and larger apical angle.

Heimia jabbokensis resembles very closely specimens figured by Davidson in 1851 (Mon. Brit. Foss. Brach. i. p. 54, pl. xiii. fig. 7) and 1855 (*loc. cit.*, Appendix, pl. A, fig. 18) as *Terebratula globata* and *Terebratula globata*, var. *fleischeri* (*loc. cit.* iv. p. 137, pl. xvii. fig. 2) from the Upper Inferior Oolite of Cheltenham. The last-named specimen is one of the type-specimens of Oppel's species *Terebratula fleischeri*. Oppel (1856, 'Die Juraformation,' p. 497) remarks on the similarity of this species to *T. globata*, Davidson (1851, pl. xiii. fig. 7). The internal characters of this form is unknown, but *T. fleischeri* is said to have the internal characters of the genus *Cererithyris*, Buckman (1917, p. 109). The umbo of *Cererithyris fleischeri* and of the other specimens probably referable to this species, but renamed by Rollier *T. oppeli* (1918, Mém. Soc. Pal. Suisse, xliii. p. 202), is less incurved, and the symphytium is not hidden. The brachial valve is more convex than in *Heimia jabbokensis*. The Palestine specimens also resemble *Terebratula buckmaniana*, Walker in Davidson, 1878 (*loc. cit.* iv. pl. xix. figs. 15 & 17), also said by Rollier to be a synonym of *T. oppeli*. *Terebratula buckmaniana* is more elongated and has less prominent plication in the brachial valve. Buckman (1917, p. 104) doubtfully refers this and similar species with which *Heimia jabbokensis* would be included to the genus *Heimia*, but states that they may be generically distinct.

Genus LOBOTHYRIS, S. S. Buckman, 1914.

Genera of some Jurassic Brachiopoda, p 2.
Def. 1917, *loc. cit.* p. 107.

" Epithyrid (beak overhanging dorsal umbo, foramen more or less elliptical, in old forms labiate, symphytium broad); morphogeny subconcavo-convex to biconvex, to elongate, to uniplicate, to sulciplicate—centronella to terebratula stage; muscle-tracks narrow, subapproximate" (*S. S. B.*).

Lobothyris ventricosa (Davidson), non Hartmann.
(Pl. XV. figs. 4 *a–c*.)

Terebratula ventricosa, Hartmann (?), Davidson, 1876, Mon. Brit. Foss. Brach. iv. pt. ii. no. 1, p. 127, pl. xv. figs. 10, 11.

Diagnosis.—Outline elongate-oval, with slightly convex biplicate brachial valve and highly convex pedicle-valve.

Pedicle-valve carinate posteriorly. Greatest width occurs about halfway down shell. Beak-ridges obscure, epithyrid. Umbo short, incurved in senile stage. Foramen circular to oval and labiate. Adductor muscle-tracks of brachial valve long, narrow, and subparallel, and resembling those of *Lobothyris*. Median septum extends for one-third of length of brachial valve.

Material.—Fourteen specimens badly preserved in a hard ferruginous sandstone. In one specimen [B. 45374] the muscle-scars and median septum of the brachial valve could be seen through the test. [B. 45361–68, 45370–74.]

Horizon.—Bajocian.

Description.—Growth-stages: the brachial valve is slightly concave near the umbo and the pedicle-valve is carinate, the carination persisting when the sulcation has died out. Both valves then become evenly convex, with circular outline and plane commissure. After considerable elongation a low median fold is developed in the brachial valve. This fold rapidly increases in elevation, and is then medianly depressed by a sulcus, giving rise to strong biplication (sulciplication of Buckman). In the pedicle-valve a median fold corresponds to the sulcus of the brachial valve.

Dimensions of figured specimen.—Maximum length 37 mm.; max. width 30 mm.; max. thickness 22 mm. or 1 : 0·81 : 0·59.

Remarks.—Davidson's specimens were obtained from the Inferior Oolite of Crickley, Cleeve, and Leckhampton Hills, Gloucestershire. The Palestine specimens are associated with *Cymatorhynchia (?) quadriplicata* in Bajocian strata.

This species resembles *Terebratula ventricosa*, Davidson, in its external form, dimensions, development, and in having internal characters of the genus *Lobothyris*, Buckman.

In their early stages the Palestine specimens resemble *Lobothyris buckmani*, Davidson, from the Inferior Oolite (1851, Mon. Brit. Foss. Brach. i. p. 44, pl. vii. figs. 15 & 16). This species is oval in outline and dorsally uniplicate, but does not develop prominent biplication as in *Lobothyris ventricosa*. The umbo in *Lobothyris buckmani* is longer and more incurved, and the two valves are less convex. In his description of *Terebratula ventricosa* Davidson queries the identity of his species with that of Hartmann in Zieten (1832, 'Versteinerungen Wurtemburgs,' p. 53, pl. xl. fig. 2). Hartmann's species attains considerably greater dimensions, is elongate-oval in outline, but is dorsally uniplicate and does not appear to develop biplication as in Davidson's species. Deslongchamps (1873, Pal. française, Terr. jurassiques, Brach. p. 260, pls. lxxiii.–lxxvi.) figures specimens similar to that of

Hartmann, but also includes some biplicate forms which appear to be distinct. Deslongchamps mentions the longitudinal striation of the shell—a character also shown in Hartmann's figure and probably representing capillation. This character is remarked upon by Buckman (1917, p. 108), who suggests that Hartmann's species belongs to the section "Capillatæ" of his classification of Jurassic Terebratulas. Capillation does not occur in Davidson's species or in the Palestine specimens. *Lobothyris ventricosa* is distinguished from "*Terebratula*" *perovalis*, Sowerby, by the difference in shape of adductors of the brachial valve, in the more massive umbo truncated by a large foramen. It is possible that *Lobothyris ventricosa* is mentioned in fossil lists from adjacent areas as *Terebratula perovalis*.

Family **Terebratellidæ**.

Genus EUDESIA, King, 1850.

A Monograph of Permian Fossils, p. 81.

Eudesia cardium, Lamarck. (Pl. XV. fig. 9.)

Terebratula cardium, Lamarck, 1819, Histoire Naturelle des Animaux sans Vertèbres, vi. p. 225, no. 47.

Terebratula orbicularis, J. de C. Sowerby, 1829, Mineral Conchology, vi. p. 68, pl. dxxxv. fig. 3.

See also:—Davidson, 1850, Ann. & Mag. Nat. Hist. ser. 2, v. p. 12, pl. xiv. fig. 47.

Davidson, 1851, Mon. Brit. Foss. Brach. i. p. 43, pl. xii. figs. 13–18.

Quenstedt, 1871, Petrefaktenkunde Deutschlands, Brachiopoden, p. 293, t. xlv. figs. 63–69.

Davidson, 1878, *loc. cit.* iv. pt. ii. no. 2, p. 185, pl. xxiv. fig. 22.

Deslongchamps, 1885, Paléontologie française, Terrains Jurassiques, Brachiopodes, vi. p. 388, pl. vi. fig. 4, and pls. cxi.-cxiv. (includes several varieties).

Haas, 1890, Abh. d. Schweiz. pal. Ges. Zurich, xvii. 2, p. 100, pl. x. figs. 8, 9.

Douvillé, 1916, Mém. Acad. Sci. Paris, lv. p. 63, pl. vii. figs. 10–15.

Material.—This species is represented by four well-preserved specimens showing the characteristic shape and ornament [B. 45299, 45400–01].

Description.—The specimens show slight variation in the total number of costæ. One specimen with length 22·5 mm. had twenty-one costæ at the anterior margin. A second specimen with length 23 mm. had twenty-five costæ. This character is also rather variable in European specimens.

Dimensions of figured specimen.—Maximum length 22·5 mm.; max. width 20 mm.; max. thickness 14·5 mm. or 1 : 0·8 : 0·6.

Horizon.—Bathonian.

Remarks.—This species is widely distributed in the Bathonian of Europe. In Great Britain it occurs in the Great Oolite, Bradford Clay, and Forest Marble. Douvillé (1916, p. 63) records *Eudesia cardium* from the Moghara Massit in the Sinai Peninsula. Hoppe (1922, Zeitsch. Deutsch. Palästina-Vereins Leipzig, xlv. p. 101) describes this species from el-Mlēh, Sinai.

No specimens of either *Eudesia plana*, Hoppe, or of *E. cardioides*, Douvillé, were obtained from Palestine, although both species were associated with *E. cardium* in the Bathonian of Sinai.

EXPLANATION OF PLATE XV.

(The figures are all of natural size.)

Fig. 1. *Avonothyris jordanensis*, sp. n. [B. 45303.] Paratype.

Fig. 2. *Avonothyris jordanensis*, sp. n. [B 45302.] Holotype. *a*, dorsal view, showing shell preserved in beekite; *b*, lateral view; *c*, anterior view, with brachial valve uppermost.

Fig. 3. *Avonothyris jordanensis*, sp. n. [B. 45307.] Paratype. *a*, internal cast, showing posterior and anterior adductor scars of brachial valve and median septum; *b*, internal cast, showing diductor and adductor muscle-scars of the pedicle-valve.

Fig. 4. *Lobothyris ventricosa* (Davidson). [B. 45374.] Immature specimen. *a*, dorsal view, showing muscle-scars and median septum; *b*, lateral view; *c*, anterior view, showing uniplication of brachial valve and initiation of median sinus.

Fig. 5. *Heimia jabbokensis* sp. n. [B. 45304.] Holotype. *a*, dorsal view, showing biplication; *b*, lateral view; *c*, anterior view, with brachial valve uppermost.

Fig. 6. *Heimia furcillensis* (Haas). [B. 45376.] *a*, dorsal view; *b*, lateral view; *c*, anterior view, with flattened brachial valve uppermost.

Fig. 7. *Burmirhynchia tumida*, Buckman. [B. 45301.] *a*, dorsal view; *b*, lateral view, showing gibbous umbo with incurved apex and convex pedicle-valve.

Fig. 8. *Cymatorhynchia* (?) *quadriplicata* (Hartmann). [B. 45300.] *a*, dorsal view; *b*, lateral view; *c*, anterior view.

Fig. 9. *Eudesia cardium* (Lamarck). [B. 45299.]

XXIII.—*A Note on some Differential Characters between* Galeodes arabs, *C. Koch, and allied Species.* By A. A. Birula, Zoological Museum of the Russian Academy of Sciences.

Galeodes arabs, C. Koch, seems to spread over a very wide area, which includes all the countries of North Africa from Algeria to the Indian Ocean, as well as S.W. Asia and the peninsula of Arabia *. Doubtless this species is not the same throughout this entire large area, and it probably forms local races in many of its parts, as is generally observed in the case of widely distributed species. However, the existence of such races in *G. arabs* has not been stated yet; therefore I consider it opportune to give a detailed description of the local race of *G. arabs* inhabiting the north-east corner of Africa, especially as there is no detailed description of this race in the literature, neither is there any detailed comparison with allied species. Such a comparison seems to me the more necessary, as a careful examination of the specimens of *G. arabs* from different parts of North Africa has shown me that this species possesses a whole series of characters which make it easy to distinguish this species from *G. araneoides*, Pall., and *G. græcus*, C. Koch, with which it was frequently confused. Unfortunately, I have no specimens of *G. arabs* which, compared in the same way, could be taken as topotypes (the type of this species, as is known, is derived from Arabia *, the locality not being more definitely known), therefore I could not state whether there exist any points of difference between *G. arabs* from North-east Africa and typical specimens from Arabia.

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* Pocock, R. I., Ann. & Mag. Nat. Hist. ser. 6. vol. xvi. p. 77 (1890).

G. arabs from North-east Africa is a large and strongly built Solpugid, which is not inferior to *G. araneoides* in that respect, but differs from the latter in its legs being considerably longer and, in general, stronger, which is especially striking when comparing the males of both species. In colouring both species differ from each other but slightly; the legs in *G. arabs* are usually not so intensely coloured with blackish brown as in *G. araneoides*. The *mandibles* (fig. 1) in the male *G. arabs* are slightly stronger, and the jaws are relatively longer; the distal part of both jaws devoid of denticles is strongly bent and thinner; the lower jaw is armed between the two chief denticles only with two intermediate denticles, of which the posterior one is not more than half the size of the anterior chief denticle—the posterior intermediate denticle being quite small, and very much smaller than the anterior intermediate denticle. A large adult male of *G. araneoides* (fig. 2) is provided on the lower jaw with three or four intermediate denticles, which are all comparatively small and very gradually diminish posteriorly; besides, the anterior intermediate denticle in this case is also considerably smaller than the anterior chief denticle. A very good distinctive character for *G. arabs* is

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* Koch, C. L., Archiv für Naturgesch. vol. iii. (1), pp. 353 & 355 (loc. typ. "Arabien"); id. Die Arachniden etc., vol. xv. 1848, p. 85, fig. 1470.

Fig. 1.

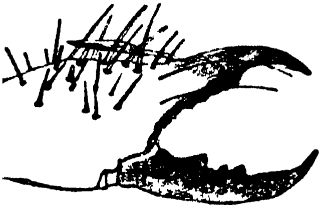


Fig. 2.

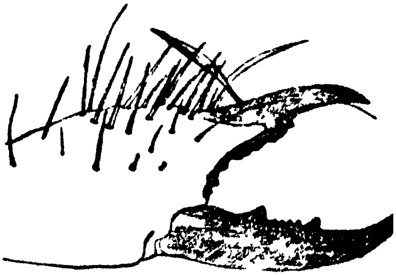
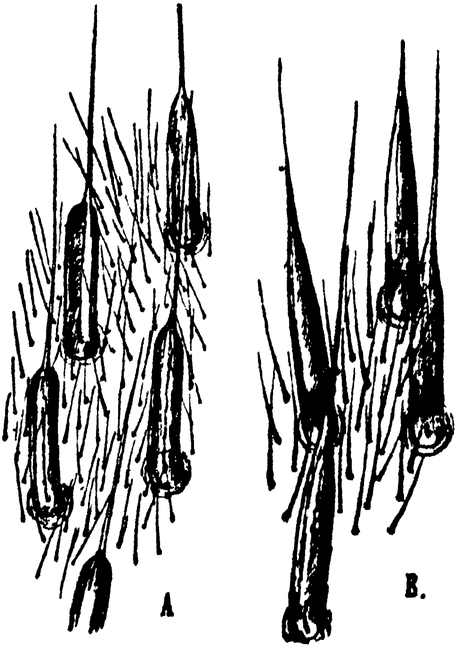


Fig. 1.—Right mandible of a male *G. arabs* (Abyssinia, Harar), external aspect.

Fig. 2.—Right mandible of a male *G. araneoides* (Caucasus, Lake Goktsha); external aspect.

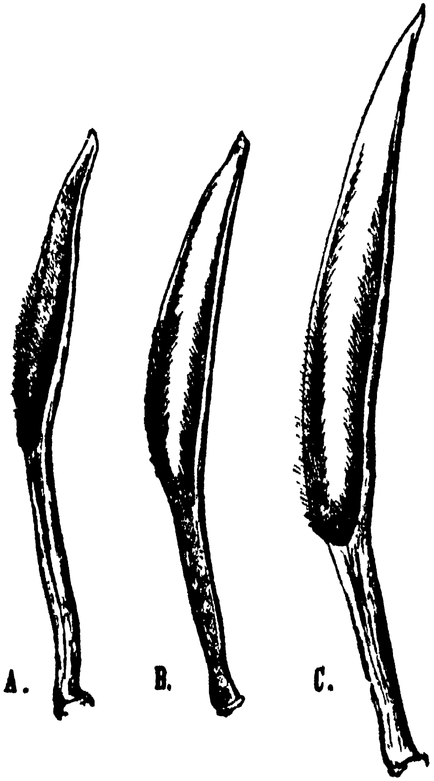
Fig. 3.



A. Setæ in the middle of the interior side of the mandible in *G. arabs* (Harar). **B.** Similar setæ in *G. araneoides* (Caucasus).

presented by *setæ* of a special form (fig. 3) on the interior side of the mandible occupying the middle of it; these setæ are short (fig. 3, A), thick, nearly cylindrical, and are provided on their blunt rounded end with a fine hair that is twice or once and a half longer than the former; besides, this hair is not attached to the very apex of the basal thickened part, but is fixed to it somewhat laterally. All these

Fig. 4.



Flagella: **A**, in *G. arabs* (Harar); **B**, in *G. araneoides* (Caucasus); **C**, in *G. caspius* (Transcaspian region, Kushka).

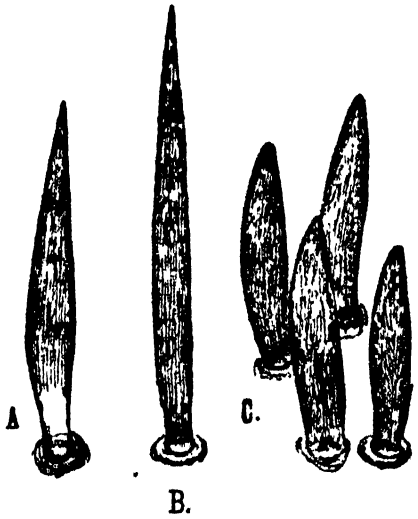
setæ, so peculiar in shape, are geniculate at the base and directed forwards parallel to each other; their number is about 15–18. Such a form of these setæ seems to be peculiar only to *G. arabs*, as in *G. araneoides*, Pall., *G. græcus*, C. Koch, and *G. caspius*, Bir.; similar setæ on the internal surface of the mandible are cylindrical only in the basal third of their length; further to the end they attenuate very gradually, and assume the form of a long filiform appendage, as may clearly be seen in the accompanying figure (fig. 3, B). In these three species the setæ differ from each other only in the degree of the attenuation of their transitory portion between the end of the thickened basal part and the base of the terminal hair. The *flagellum* also differs considerably in form in the males of *G. arabs* from that in *G. araneoides*, *G. caspius*, and the allied species—namely, in *G. arabs* the scapum (fig. 4, A) is hardly longer than the pedunculum, not more than one-fifth of its total length; besides, the scapum narrows nearly uniformly towards the base on both its edges and gradually passes into the pedunculum, so that the scapum is not provided with an expansion on its upper edge, which renders it asymmetrical, as in *G. araneoides* and *G. caspius* (fig. 4, B and C). In these species, as well as in *G. græcus*, the flagellum is knife-shaped—*i. e.*, with a distinctly widened upper edge and nearly straight lower edge; besides, in these species the pedunculum is relatively much shorter—*i. e.*, in *G. araneoides* and *G. græcus* nearly twice, and in *G. caspius* more than twice. The *head* in all the species named is trapezoid, but in *G. arabs* it is above, between the ocular tubercle and the posterior margin, more regularly convex, nearly semicircular when viewed from the side; whereas in *G. araneoides* the upper part of the head is less convex, and immediately posterior to the ocular tubercle, on the occiput, it is nearly flat. The *ocular tubercle* in *G. arabs* is comparatively large, high, with large eyes, the space between which is slightly less than the diameter of the eye—for example, in two specimens of either species, with the same width (about 10 mm.) of the anterior margin of the head, the width of the ocular tubercle in *G. arabs* is 2·2 mm. and in *G. araneoides* 1·8 mm.

As has been mentioned above, the mandibles and all the appendages in *G. arabs* are distinctly longer and thinner in comparison with the length of the trunk than in *G. araneoides*; thus, if we compare two specimens of either species of about the same size, the dimensions of the mandibles and that of the appendages will be as follows:—

	G. arabs.	*G. araneoides.*
	mm.	mm.
Width of head	10·0	10·0
Length of mandible	13·8	12·3
„ femur of palpi	24·2	20·0
„ tibia „	22·2	16·0
„ metatarsus of palpi	15·0	12·0
„ tarsus „	8·7	3·5

The *palpi* in both the above-named species are nearly similar, armed with spiniform setæ and marginal spines, except that in *G. arabs* the metatarsus is armed with seven pairs of marginal spines and the cylindrical spines of its lower side are relatively longer and thicker, and are set further from each other—*i. e.*, not so close as in *G. araneoides*. On the metatarsus of the palpi in *G. arabs* the distal pair of marginal spines is of nearly equal length with the diameter of the end of this segment, and slightly longer than the preceding pair of marginal spines; in *G. araneoides*, on the contrary, this pair of spines is visibly longer than the diameter of the transverse section of the segment and nearly twice as long as the neighbouring pair of spines. A visible difference between the two species is observed in the structure of the tarsus of the fourth pair of legs: in *G. arabs* the segments, as well as the claws and marginal spines, are relatively longer and thinner than in *G. araneoides*; besides, the peculiar scale-shaped setæ on the lower side of the tarsal segments in the male *G. arabs* are of a different form to

Fig. 5.



Scale-shaped setæ on the lower surface of the tarsal segments of the fourth pair of legs in the male: **A**, in *G. arabs* (Abyssinia, Harar); **B**, in *G. araneoides* (Caucasus, Goktsha). **C**, a group of the same setæ from the tarsus of *G. caspius* (Transcaspian region, Kushka).

those in *G. araneoides*—in the former species (fig. 5, A) they are comparatively wide, abruptly pointed, more narrowed towards the base, and they are not closely set, whereas in the latter species (fig. 5, B) they are narrow, become pointed gradually, and slightly narrowed towards the base; *G. græcus* is distinguished from these two species by its scale-shaped setæ becoming pointed on a still greater length than in *G. araneoides*, with a nearly filiform ending; for the rest they resemble those of *G. araneoides*. Thus, in all the species named above the scale-shaped setæ on the lower surface of the tarsus of the fourth pair of legs are more or less pointed; as concerns the typical race of *G. caspius*, in that species these setæ differ sharply in their form (fig. 5, C), for they are long, wide, slightly narrowed towards the base, and blunted or rounded at the apex.

The armature with marginal spines on the locomotor legs in *G. arabs* is as follows:—

	Metatarsus:	Tarsus:
Second and third leg ..	$\frac{1+1+1+1+1}{1+2}$	1+2+2
Fourth leg	$\genfrac{}{}{0pt}{}{0}{1+2+2}$	2+2+2/2/0

In *G. araneoides* the armature of the second and third pairs of legs on the tarsus is mostly 2 + 2 + 2, rarely 1 + 2 + 2, and of the fourth pair of legs on the tarsus 2 + 2 + 2/2/0. In *G. caspius* the armature of the second and third pairs of legs on the tarsus is 2 + 2 + 2, and of the fourth pair of legs on the tarsus 2 + 2 + 2/2/2.

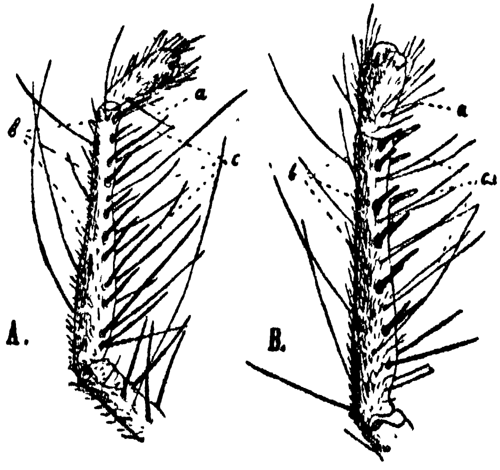
In addition to all the above-named characters that serve to distinguish *G. arabs* from *G. araneoides*, there is another one which is very suitable for that purpose—namely, the presence of the so-called *ctenidia* or *ctenidial setæ* on the lower surface of the abdomen in *G. arabs* and their complete absence in *G. araneoides*; the ctenidia are situated in *G. arabs*, as usual, on the posterior margin of the fifth abdominal sternite, mostly symmetrically on both sides from the median body-line to the number of ten to fifteen or more; they are arranged in one simple transverse row, slightly retiring from the margin of the segment, set closely, and of a reddish colour, on account of which they are distinctly visible among the light yellow hairs covering the lower surface of the abdomen; their length is about 2·0–2·5 mm.; they are thicker than the surrounding hairs and setæ, flat, slightly widened in the middle, narrowed towards the base, and pointed at the end. In the large old specimens of *G. arabs* the ctenidia are often present also on the remaining surface of the fifth sternite, being irregularly arranged, but more or less symmetrically, on either side of the median line of the segment; in some cases separate ctenidia are sparsely distributed on both the neighbouring (fourth and sixth) sternites. In *G. græcus* the ctenidia are also present, whilst, on the contrary, in *G. caspius* (at any rate, in typical specimens) and in the northern races they are absent.

The female of *G. arabs* differs from the females of the allied species in characters less distinctly expressed than in the male; nevertheless, there exist a series of quite clear distinctive characters, which serve to distinguish female and young specimens of this species from those of *G. arabs* without any difficulty. These characters are compared in the following table:—

Galeodes arabs, C. Koch, ♀. (Abyssinia, Harar.)	*Galeodes araneoides* (Pallas), ♀. (Caucasus, the vicinity of Lake Goktsha.)
1. On the upper jaw between the two chief denticles—*i. e.*, between the third and fifth large denticles—there is one intermediate denticle, but posteriorly to the latter there is no space devoid of denticles.	1. On the upper jaw between both chief denticles—*i. e.*, between the third and sixth large denticles—there are two intermediate denticles, the posterior one being much smaller.
2. On the lower, mobile jaw, between both chief denticles, are set two intermediate denticles, the posterior one being considerably smaller than the anterior; behind there is no space devoid of denticles.	2. On the lower, mobile jaw, between both chief denticles, are set three intermediate denticles, gradually diminishing backwards; when there are only two intermediate denticles, there exists behind them a space devoid of denticles.
3. The spiniform setæ in the middle of the internal surface of the mandible are the same as in the male—*i. e.*, of cylindrical form at the apex, bluntly rounded, and provided with a fine hair asymmetrically situated (fig. 3, A).	3. The spiniform setæ in the middle of the external surface of the mandible very gradually attenuate towards the end, as in the male, into a fine hair (fig. 3, B).
4 On the metatarsus of the pedipalpi the marginal spines (fig. 6, A, *b*) are much longer than the diameter of the segment at the point of their attachment, and become pointed gradually; the marginal setæ situated between them are nearly as thick as the spines (fig. 6, A, *c*).	4. On the metatarsus of the pedipalpi the marginal spines (fig. 6, B, *c*) are shorter than the diameter of the segment at the point of their attachment and abruptly pointed; the marginal setæ situated between them are not thickened, very fine, and have the appearance of long hairs (fig. 6, B, *c*).

Galeodes arabs, C. Koch, ♀. (Abyssinia, Harar.)	*Galeodes araneoides* (Pallas), ♀. (Caucasus, the vicinity of Lake Goktsha.)
5. The unpaired seta (fig. 6, A, *a*) on the internal surface of the tarsus of the pedipalpi is distinctly thickened.	5. The unpaired seta (fig. 6, B, *a*) on the internal surface of the tarsus of the pedipalpi is thin and has the appearance of a hair.
6. Tibia of the pedipalpi is visibly longer than the mandible.	6. Tibia of the pedipalpi is more or less shorter than the mandible.
7. The length of the metatarsus of the pedipalpi is visibly greater than the width of the head at its anterior (frontal) margin.	7. The length of the metatarsus of the pedipalpi is not greater than the width of the head at its anterior (frontal) margin.
8. Tarsal segments of fourth pair of legs long and thin and armed with marginal spines, the length of which slightly exceeds the diameter of the segment.	8. Tarsal segments of fourth pair of legs comparatively thickened—*i. e.*, thick and short,—armed with marginal spines, the length of which does not exceed the diameter of the segment
9. The second and third pairs of legs are armed on the tarsal segments with $1+2+2/2=7$ marginal spines.	9. The second and third pairs of legs are armed on the tarsal segments with $2+2+2/2=8$ marginal spines.

Fig. 6.



The last segments of the pedipalpi of a female viewed from the interior side: **A**, in *G. arabs* (Harar); **B**, in *G. araneoides* (Caucasus). *a*, unpaired seta of tarsus; *b*, marginal spines; *c*, marginal setæ.

XXIV.—*Acari of the Family* Gamasidæ: *new and rare British Species.* By the Rev. J. E. Hull.

[Plates XVI.-XIX.]

With two exceptions (11, 23) the species enumerated below are figured on the Plates under the numbers prefixed to their names in the text.

Subfamily *Uropodinæ.*

Dr. Berlese's 'Intorno agli Uropodidæ' (1917), which I had not seen when my list of British Gamasidæ was published in 1918 (Trans. Nat. Hist. Soc. Northd., &c., new series, vol. v. part 1), makes a few changes necessary in the nomenclature and classification I then followed. In the first place, the genus *Trachytes* is to be included here (along with *Uroseius* and others), instead of being numbered with the Zerconinæ. The name *Dinychus* disappears, as Krämer's type does not seem to be congeneric with the rest; and for these the name *Prodinychus* will stand (type, *fimicola*, Berl.).

Moreover, it appears that by following Berlese in writing *Cyllibano*, Heyden, I have fallen into error. I have not seen Heyden's paper ('Isis,' 1827), but Dr. Sig. Thor assures me that Heyden wrote "*Cylliba* no.," where "no." is his abbreviation for "nobis." The true name of the genus is therefore *Cylliba.*

Furthermore, it turns out that *Haluropoda interruptus*, Halb., is identical with Berlese's *Phaulodinychus repletus*. Other corrections and additions appear below.

1. *Urodiaspis persimilis*, sp. n. (Pl. XVI.)

This is the species recorded by me (*op. cit.* p. 49. no. 25) as *Urodinychus tectus*, Krämer. I was aware that it did not square with Krämer's species in some points, and I am now satisfied that the difference was not accidental, for I find there are other differences, and the two species are not even of the same size. The existence of two species, evidently congeneric—perhaps even a third,—reconciles me to the adoption of Berlese's genus.

2. *Urodiaspis anomalus*, sp. n. (Pl. XVI.)

I place this under *Urodiaspis* with great hesitation. I possess a single female which shows the small secondary dorsal scutum; but the main scutum lacks the median ridge (present in both *tectus* and *persimilis*), has the chætotaxy of *Liodinychus*, and is continuous with the marginal scutum in front. Moreover, the marginal scutum is interrupted behind precisely as in *Phaulodinychus minor*, Halb. There is not a real perigenital scutum, but the epigynal valve is enclosed by a chitinous rim which follows its outline

The uniformly convex dorsal scutum is well clothed with short hairs following the usual disposition of *Liodinychus* along the middle line—that is, following a median band which spreads more or less fanwise behind. The actual margin of the dorsum appears to be continuous with the ventral scutum; therefore the lateral scuta are a little distant from the margin.

The epigynal valve is of rather unusual shape. From a narrow rounded extremity in front the sides diverge uniformly backwards and then are rather suddenly turned inwards before continuing to the posterior margin.

One example only, taken in West Allendale, Northumberland.

URODINYCHUS, Berl.

Berlese has set up three subgenera, of which two are European—*Oodinychus*: type, *janeti*, Berl.; *Liodinychus*: type, *kramerii*, G. R. Can., the type of the genus being *carinatus*, Berl. In Britain *Oodinychus* is represented by the type-species; but the rest can hardly be associated with *kramerii* or with *carinatus*, as the following classification will show:—

i. Myrmecophilous species.
  § 1. [*Urodinychus*, s.s. Not British.]
  § 2. *Oodinychus*. One British species .... *janeti*.
ii. Free-living species.
  § 3. *Liodinychus*. Ventral scutum divided transversely in front of the anus (as in *Uroplitella*). One British species .... *kramerii*.
  § 4. Ventral scutum undivided; epigynal valve running to a long point in front, reaching or passing the sternal fore margin. British species .... *campomolendinus, punctatissimus, ovalis, thorianus, lucidus, sartor, biquadratus*.
  § 5. Ventral scutum undivided; epigynal valve broadly rounded in front, barely reaching coxæ ii. British species...... *roseus, viduus, winterii*.
  § 6. Ventral scutum undivided; epigynal valve narrowly rounded in front, reaching the middle of coxæ ii. Dorsal margin crenulate. British species (both from moles' nests) ... *minusculus, similis*.

Of the species in § 6 only the females are known. It is pretty certain that a knowledge of both sexes will result in the formation of a new genus. For the present, however, they may be regarded as a subgenus under the name of *Pseudodinychus*. For my own part I should have preferred to leave the rest undistinguished; but that would link them directly with *carinatus*, which would be utterly misleading. Since they must have names, let § 4 be *Lonchothura* and § 5 *Cyclothura*.

Biquadratus, *viduus*, *similis*, and *winterii* have been described ('Vasculum,' vii. pp. 18, 19), but not figured. Figures are now given (Pl. XVI. figs. 33–36).

3. *Uropoda berniciensis*, sp. n. (Pl. XVII.)

Length of female 570 μ; breadth 480 μ. Male unknown.

Body elliptic, narrowed before and behind, broadest a little behind the shoulders, which are not very prominent. Dorsal scutum brown, smooth, but not shining; setæ very few. The hind margin is quite straight. The small posterior shield is narrow oblong, but slightly convex behind. Opposite to it the marginal scutum is much narrowed, leaving a considerable space between; from the point where the narrowing begins and nearly to the middle of the lateral margin the marginal scutum is reflexed over to the ventral surface.

The epigynal plate is a narrow ellipse, truncate behind.

A single female, Fatfield, Durham (*R. S. Bagnall*).

4. *Uropoda corticalis*, sp. n. (Pl. XVII.)

Length of female 600 μ; breadth 380 μ. Male unknown.

Very broad at the shoulders, though the greatest breadth is, as usual, near the middle of the body; but it is not so much greater than the breadth at the shoulders as in either *obscura* or *berniciensis*. The dorsal scutum is oblong with sides nearly parallel; as a result, it overlaps the marginal scutum for a considerable distance in its posterior half. The surface is smooth and well clothed with erect spiny hairs, three series on each side. There is a series of similar hairs on the marginal scutum, and another on the margin itself. The small posterior scutum is trigonous.

The epigynal plate is nearly oblong, circularly rounded in front, truncate behind.

Females under bark of a fallen ash-tree, West Allendale.

5. *Urobovella obovata*, Berl. (Pl. XVI.)

Northumbrian examples of this species, taken with *Formica fusca,* considerably exceed the dimensions given by Berlese, though still falling short of the size of *notabilis.*

As the nymph has hitherto escaped observation, I give figures of it (first stage ; the second resembles the adult).

6. *Uroplitella donisthorpii*, Hull. (Pl. XVII.)

Taken by Donisthorpe with *Myrmica* spp., and originally recorded as *U. ovatula*, Berl. A description has already been given ('Vasculum,' vii. p. 18), but without figures, which are now supplied.

7. *Urodiscella signata*, Hull. (Pl. XVI.)

Easily recognised by the pitted dorsum and the very narrow marginal scutum. For description, see Trans. Nat. Hist. Soc. Northd., &c., new series, vol. i. part 1, p. 50.

8. *Prodinychus delectus*, sp. n. (Pl. XVII.)

Length of female 630 μ ; breadth 380 μ. Male unknown.

General form of *P. vartismithii*, but the prodorsum is less acute in front and the colour is darker. The dorsal scutum is very definitely divided from the marginal in front, less distinctly behind, where the marginal (as usual) is very much narrowed. Two parallel ridges traverse the disc longitudinally, vanishing forward, but spreading into a rounded area behind. In the hollow between them and on either side of them the surface is faintly pitted, but there do not appear to be any hairs. The lateral rim is irregularly crenate, and the sides converge to a bluntish point in front. The marginal scutum is externally crenulate all round, and of uniform width everywhere except along the posterior margin. It is fringed with a series of short fine spines.

The epigynal plate is of the ordinary quadrate form, broader behind than before, rounded at the angles and along the anterior margin.

Two or three females under bark of a dead ash, West Allendale.

40. *Prodinychus longiforis*, sp. n. (Pl. XVII.)

Length of female 820 μ.

General appearance of *fimicola*, but prodorsum more acute. The dorsal scutum is oblong, rounded in front, truncate behind ; covered with pretty large punctures. It is everywhere quite separated from the marginal scutum. The dividing furrow is a mere suture in front, but at the sides expands to more than half the width of the marginal scutum, finally disappearing at the posterior angles, where the boundary between the two scuta is a straight line, surmounted by a transverse row of four bacillar setæ. A little distance in front of this is a parallel line, which sweeps forward at each end to run to the margin. In the obtuse angle thus formed stands a spiny seta. A series of similar spines stands in the lateral furrow, projecting obliquely over the marginal scutum, on the outer rim of which is an exactly similar series.

A transverse furrow immediately in front of the anus divides the ventral scutum into two parts, both densely punctured like the dorsal. So also is the genital valve, which is of quite unusual form for a *Prodinychus*, being an elongate ellipse, truncate behind.

The peritreme is considerably extended behind the stigma. Forward it makes a simple quadrate bend towards the body-margin and then continues its original course.

West Allendale, in manure.

Subfamily *ANTENNOPHORINÆ.*

9. *Antennophorus foreli*, Wasm. (Pl. XVII.)

The female has been on record (Messrs. Donisthorpe, Crawley, and Buxton) for some time for the south of England, but apparently the unknown male did not turn up until quite recently. It makes its home with *Lasius* spp. The male is 1080 μ long and 740 μ in its greatest width. With a figure of the mandible I include a sketch of the stigma and its connections. The peritreme, which occupies the usual position, is characteristic of the subfamily —externally cylindrical, internally a spiral of quadrate cross-section.

Subfamily *LÆLAPTINÆ.*

10. *Eulælaps affinis*, sp. n. (Pl. XVI.)

This is the species recorded by me under the name of *Lælaps echidninus*, Berl. The latter is not a *Eulælaps* at all, but a genuine *Lælaps*.

E. affinis is very near indeed to *E. stabularis*, K., but the female may be distinguished by the form of the sternal scutum which is nearly straight behind. Of both sexes the cuticle is more scabrid, and the pubescence less dense but stronger. The genital scutum of the female is nearly circular behind, whereas in *E. stabularis* it is more or less trapezoid. Larva and nymph are probably parasites on rodents.

11. *Eulælaps lapidarius*, sp. n.

Length of female 1100 μ; breadth 600 μ.

The form is a broader oval than in *E. stabularis*, with prominent shoulders; also the surface of the scuta—both dorsal and ventral—is smoother and distinctly reticulate, sparsely clothed with curved hairs.

The sternal scutum extends to the fourth coxæ, and the hinder margin is overlapped by the genital scutum in all its width. The reticulations are smaller than those on the other two ventral scuta. The genital shield resembles in form those of *E. affinis*, but the only hairs are three lateral on each side. Posterior margin wide, straight, parallel to and almost touching the anal scutum. The latter is triangular with rounded angles, not twice as long as wide.

Under stones, West Allendale. Male unknown.

12. *Lasioseius cristatus*, sp. n. (Pl. XVIII.)

Length of female 440 μ; width 280 μ.

Outline of dorsum elliptic-oblong, abruptly narrowed at the shoulders, leaving the latter conspicuously prominent. Three series of thickened slightly pectinate setæ on each side. Vertical setæ broadly pinnate.

Sternal scutum reaching laterally to the middle of coxa iii., but deeply excavated behind; its surface scored with fine longitudinal striations. Genital scutum rounded in front, broader and truncate behind; sides concave.

Outline of ventro-anal scutum subcircular, flattened in front, where it runs parallel to the hind margin of the genital scutum. Length 130 μ; breadth 168 μ. The surface is transversely striate or wrinkled.

Male unknown. Females taken at Hunter's Tryst, Midlothian, by the late Mr. W. Evans.

13. *Lasioseius jugatus*, sp. n. (Pl. XVIII.)

Length of female 580 μ; breadth 390 μ.

The outline of the body is oval, and the dorsal scutum does not cover the whole of the dorsum; it is somewhat oblong in form and reaches the margin in all its width behind—elsewhere only at the shoulders. The surface is finely reticulate, and bears six rows of clavate setæ, with four rather larger setæ on the hind margin. Similar setæ occur on the legs. The rest of the marginal setæ are much smaller, thickened, but hardly clavate.

West Allendale, females only, in nest of shrew.

14. *Ameroseius sulcatus*, sp. n. (Pl. XVIII.)

Length of female 500 μ; breadth 350 μ.

Elliptic-oblong, more or less zerconiform. The dorsum is flattened and abruptly depressed near the hind margin. Two longitudinal furrows run forward from the boundary of this depression straight and parallel. The surface is scabrid and bears slender curved spines on the posterior half of the dorsum, chiefly marginal. Each dorsal furrow bears a *straight* spine at its posterior extremity.

The legs are uniformly clothed with short hairs.

Ambleside, a single female.

LÆLIPHIS, gen. nov

General characters of *Hypoaspis*, but there is a line of division between the sterno-genital scutum of the male and the subcircular anal scutum; the sternal scutum of the female is deeply excavated behind, both genital and anal scuta pretty large and subcontiguous; no lateral scuta, but a pair of minute linear scutella behind coxæ iv.

Type: *fuscipes* (see below).

15. *Læliphis fuscipes*, sp. n. (Pl. XVI.)

Male, 1000 μ long, 720 μ wide; female, 1100 μ long, 740 μ wide.

Body slightly obovate, hardly shouldered. Cuticle smooth, yellow-brown. Dorsum strongly arched, setæ few, mostly lateral.

Legs rather long, their setæ spinous; all the articles dark brown, except the coxæ which are of the same colour as the body. Tarsus i. nearly cylindrical, very little narrowed at the apex.

Venter of the female with scuta of the same colour as the dorsal. Sternal scutum deeply excavated behind to accommodate the genital, scabrid, with two pairs of transverse setæ. Genital scutum broadly bottle-shaped, glabrous, truncate behind, where it is nearly in contact with the anal scutum. The latter is truncate in front, rounded behind, slightly longer than broad.

Epistome rounded and finely crenulate.

Swanage (*R. S. Bagnall*).

Very like *Hypoaspis myrmecophilus*, but easily distinguished by the form of the ventral scuta and the dark legs.

16. *Læliphis birksianus*, sp. n. (Pl. XVIII.)

Length of female 780 μ; breadth 510 μ.

In general form very like the preceding, but body and legs are of the same colour. Dorsum smooth, faintly reticulate, and sparsely clothed with short hairs.

Sternal scutum very finely rugoso-reticulate, with two pairs of lateral spines; excavated behind to a depth equal to the diameter of the adjoining coxa (iii.).

The genital scutum is sandal-shaped, widest in the posterior third of its length. Its surface is smooth and polished, sparsely scored with fine longitudinal striations, forked behind where they are crossed by three transverse striæ of the same character. The front margin, which projects into the deep sinus of the sternal scutum, is not striate, but roughly wrinkled. There are no spines or hairs on any part of this scutum, but three pretty long slender spines stand just outside of it on either side and project over its surface. A fourth pair stand at the posterior margin and project along the narrow interval between it and the anal scutum. The latter is heart-shaped (with its apex behind) and rather coarsely reticulate.

Staffordshire, on dead wood (*Rev. S. G. Brade-Birks*).

Male unknown.

17. *Androlælaps hermaphrodita*, Can. (Pl. XVIII.)

A female of this species was sent to me by the late Mr. W. Evans, taken at Hunter's Tryst. The same sex was taken by myself in West Allendale. So far as I know, this is the first British record. *Androlælaps* is a genus founded by Berlese to receive this and another species, both of which have the second pair of legs spurred in the female as well as in the male.

18 *Hypoaspis latifrons*, sp. n. (Pl. XVIII.)

Length of female 500 μ; breadth 310 μ.

Oval, truncate in front. Dorsal scutum smooth, faintly reticulate, with fine short pubescence.

Sternal scutum smooth, slightly broader than long, bearing two pairs of fairly strong lateral spines. Hind margin lightly excavated.

The genital scutum is flask-shaped, the posterior part circular, smooth, the anterior margin, with parallel sides, longitudinally striate.

The anal scutum is very obtusely trigonous, broader than long.

The peritreme never reaches the lateral margin of the body, but bends inward around coxa ii. The legs are rather stout.

Collected by Mr. C. D. Soar. Locality unknown.

19. *Hypoaspis compressus*, sp. n. (Pl. XVIII.)

Length of female 600 μ; breadth 350 μ.

Elongate-oval. Dorsal scutum smooth, clothed freely with short hairs. The shoulders are quite obsolete.

Sternal scutum broader than long, slightly concave behind, bearing two pairs of lateral spines.

Genital scutum flask-shaped, with wide neck, quite smooth and glabrous. The anterior region is ill-defined, but not striate.

Anal scutum small, its width half that of the genital scutum; trapezoid behind, circularly curved in front, where it is rather widely separated from the genital scutum. It bears three setæ, two lateral and one posterior, longer than the other two.

Ventral surface smooth, pretty hirsute, with two prominent bristles on the posterior margin, but none on the lateral.

Course of peritreme as in the preceding species. Second leg stout.

Collected by Mr. C. D. Soar. Locality unknown.

20. *Hypoaspis soarianus*, sp. n. (Pl. XVIII.)

Length of female 660 μ; breadth 450 μ.

Elliptic-oblong with well-marked shoulders. Dorsal scutum smooth and apparently with faint reticulations; pubescence moderately dense; setæ slender, curved.

Sternal scutum quite as long as broad, nearly straight behind, bearing the usual two pairs of lateral setæ.

Genital scutum urn-shaped, the fore part very indistinct, not striate. Surface smooth, no reticulations visible in the mounted specimen. A strong seta stands between the lateral margin and coxa iv. on either side projecting over the scutum.

Anal scutum fairly large, trigonous, longer than wide, bearing three setæ of equal length, two lateral, one posterior.

Ventral surface setate near the scuta, glabrous elsewhere.

Two minute linear scutella in the glabrous part, one on either side, second pair of legs stouter than the rest.

The peritreme is normal in position, running direct to the margin at the shoulder. From the shoulders backward the margin bears a series of slender curved setæ.

In the collection of Mr. C. D. Soar; locality unrecorded. Male unknown.

21. *Hypoaspis soricinus*, sp. n. (Pl. XVI.)

Length of male 500 μ; breadth 310 μ.

Oval, broadest behind; shoulders nearly obsolete. Dorsal scutum finely and uniformly covered with quadrate reticulations. Setæ few, short, curved.

Ventral scutum undivided, but the sterno-genital region is conspicuously distinguished from the rest by the nature of the surface-markings. It is wholly covered with undulate striæ, more or less transverse in front, partly longitudinal behind. Immediately behind the posterior coxæ the striation is entirely and regularly transverse, practically straight. The sides of the venter are like the dorsum.

There is a marginal series of short setæ, sharply curved.

A single male was taken on a shrew in West Allendale. It seems to be closely related to *H. bombicolens*.

22. *Hypoaspis fucorum*, sp. n. (Pl. XVIII.)

Length of male 560 μ; breadth 320 μ.

General form a rather narrow-oval, hardly shouldered. Dorsal scutum regularly and uniformly reticulate with polygonal reticulations, pretty densely hirsute with soft setæ, which are longer behind and extend to the sides of the venter.

Sterno-genital region of the ventral scutum rather more widely reticulate than the dorsum, but in the same fashion. Behind the posterior coxæ the dividing striations are mostly transverse and closer together, so that the surface has the appearance of being transversely wrinkled.

The second pair of legs is slightly stouter than the rest. The peritreme runs direct to the margin.

This male also seems to belong to the group of *H. bombicolens*. It was, as a matter of fact, taken from a nest of *Bombus smithianus* in West Allendale.

Lælaspis humeratus, Berl.

Females of this species (length 580 μ) were taken by Donisthorpe in the nest of *Tetramorium cespitum* in Cornwall, 1920, when the species was new to the British list. In the following year it was taken by Crawley with *Lasius umbratus*.

Subfamily *GAMASINÆ*.

MACROCHELES, Latr.

Dr. Berlese has recently found it necessary to divide this important genus into subgenera, and still more recently Mr. W. Falconer ('The Naturalist,' 1923, p. 151) added another subgenus, so that the arrangement now includes all the forms known in the British Isles. For some years I have been accumulating material with a view to subdividing a genus which was becoming unwieldy. Meanwhile, Berlese's arrangement was published, and, though it has doubtful features in it, I prefer to take it as it stands with Falconer's necessary addition. As the latter has adequately outlined the scheme, I do not now repeat it, but simply describe the various forms which have accumulated on my hands.

23. *Macrocheles (Geholaspis) castaneus*, sp. n.

In form and size this is very like *longispinosus*, but the colour of the dorsal scutum is a rich red-brown, and the dorsal setæ are longer and finer, especially on the margin of the body. The vertical setæ are similarly contiguous, but the adjacent pair of flexuous hyaline setæ do not appear in the present species.

The reticulation of the dorsal scutum is much the same as that of *longispinosus*, but the scutum itself covers the whole of the dorsum—which is not the case in any of my specimens of *longispinosus*.

The crest of the epistome widens above the base into a diamond-shaped expansion, and then narrows into a longish slender point. Both above and below the expansion the lateral margins are strongly denticulate.

Females only, among dead leaves, West Allendale.

24. *Macrocheles (Nothrholaspis) pannosus*, sp. n.
(Pl. XVI.)

Length 900 μ.

Broad-oval, well-shouldered, the frons narrow, with erect crassate vertical setæ.

The dorsal scutum is of somewhat irregular shape, and falls far short of covering the whole of the dorsum. It parts from the margin at the shoulders, the sides being parallel for a short distance and then converging to the posterior margin, of which the width is slightly less than half that of the dorsum. The disc is regularly reticulate and bears on each side three series of curved and crassate setæ beginning from the shoulder—four lateral, then five, then six. In front of the shoulders there are none.

The humeral seta is as usual the largest of all and is like the rest, simply thickened, neither clavate nor tapering. Close to it is the first of the marginal setæ, which are quite uniform and exactly like the dorsal setæ.

The ventral scuta are as abnormal as the dorsal, for the division between the genital and the ventro-anal is hardly visible, and the outline of the two appears to be continuous. The former is of the usual shape, the latter is subcircular, a little flattened before and behind. Both are regularly and smoothly reticulate.

In manure, West Allendale.

25. *Macrocheles* (*Nothrholaspis*) *matrius*, sp. n. (Pl. XVI.)

Length 870 μ ; breadth 560 μ.

From the shoulders backward a regular ellipse. Vertex rounded, rather narrow.

The dorsal scutum leaves bare a narrow uniform margin from shoulder to shoulder. The disc is evenly reticulate with punctate striæ. There is a marginal series of clavate setæ which begins a little within the margin and before the shoulder. The fourth of the series is the first situated on the actual margin. There is a single submarginal clavate seta on each side, on the middle part of the disc three pairs of simple acute setæ.

The sternal scutum is raised in the middle and traversed on either side by a network of ridges (see Plate).

The genital scutum is quadrate, with a convex front margin. The border adjacent to this margin is white and moderately broad but tapering to a point at the posterior angle, leaving in the middle a trapezoid area with a few dot-bordered striæ.

The ventro-anal scutum is in contact with the genital, and is roughly circular with a narrow extension around the anus. Striæ bordered by a line of dots on the posterior side run transversely across it in concentric curves. Each is joined to its neighbour by faint dotted cross-lines, thus forming wide reticulations.

The male has no spur on the femur of the second leg.

Not uncommon in the north of England. Abundant in poultry-manure, West Allendale.

26. *Macrocheles* (*Nothrholaspis*) *nemoralis*, sp. n.
(Pl. XIX.)

Length of female 810 μ; breadth 500 μ.

Form of the body a rounded-oblong with strongly-marked shoulders and prodorsum (or pre-humeral region) roughly pentagonal. Vertical seta small. Dorsal scutum leaving a narrow border exposed; finely and evenly reticulate, each space dotted all over.

Marginal setæ of dorsal scutum and of the body similar, clavate, increasing in size behind. Humeral setæ similar to the posterior and connected by a transverse series of six of like form but smaller size. Three submarginal clavate setæ near the shoulder.

The sternal scutum of the female has two transverse ridges in the hinder part, and two lesser (longitudinal) in front of them; between these a roughly-pitted area.

The genital scutum is quadrate, but spreads out behind to meet the much wider ventro-anal scutum, which is convexly trigonous, terminating in a point behind. The genital scutum is widely reticulate in the middle, leaving a plain border in front and at the sides. The reticulations of the ventro-anal are of similar large mesh. The striæ are very fine and angular (*i. e.*, not curved), and the enclosed spaces are pretty thickly covered with dots, though these are less numerous on the genital scutum.

The limb of the epistome is not bifurcate, and the arms of the forked crest are pectinate on the upper side.

West Allendale.

27. *Macrocheles* (*Nothrholaspis*) *occidentalis*, sp. n.
(Pl. XIX.)

Length of male 1130 μ. Female unknown.

Of the usual well-shouldered form. The dorsal scutum follows the margin of the body from the shoulder to a point just above the projection of the peritreme; then the sides converge rather rapidly, so as to leave a pretty wide uncovered space behind. The regular reticulations are a little wider than usual. The scutum has no marginal series of setæ, though there are four setæ near the posterior margin. Sixteen others are scattered over the disc, leaving the lateral margins (behind the shoulders) bare. All these are simple slender bristles, of considerable length.

The vertical setæ are thickened, but not clavate; the humeral are clavate and curved. Immediately behind each of them is a slender flexuous seta, pointing backwards. The body-margin has six shorter bristles on each side in its posterior half.

The epistome is finely denticulate along its fore margin, and the crest is a simple bifurcate seta.

The venter and legs are normal, calling for no remark.

A single male was sent to me by Mr. J. C. Varty-Smith of Penrith, taken among dead leaves.

28. *Macrocheles* (*Nothrholaspis*) *parmulatus*, sp. n. (Pl. XIX.)

Length of female 1200 μ. Male unknown.

Oblong, strongly shouldered. The dorsal scutum leaves the usual bare body-margin. The vertical setæ are clavate and straight; the humeral clavate, curved. Behind the vertical is a pair of clavate setæ; between the two humeral a transverse series of eight; immediately behind these another row of six. The rest of the disc bears three pairs of clavate and five pairs of simple spiniform setæ, intermingled. One pair of the latter project over the posterior margin in the middle. There is a continuous marginal series of clavate setæ, and a similar series on the body-margin.

The sternal scutum is ridged, but my specimen does not show the details. Genital scutum of usual form, widely reticulate in the middle. The ventro-anal is in contact with it, much wider than long, transversely elliptical, bearing three pairs of spiniform setæ. It is unusually small, and evenly reticulate (like the dorsal scutum). Two tiny lateral scutella lie immediately behind coxæ iv.

West Allendale; habitat unknown.

29. *Macrocheles* (? *Nothrholaspis*) *gloriosus*, sp. n. (Pl. XIX.)

Length of male 1200 μ. Female unknown.

Body rounded-oblong, vertical area also rounded. Vertical setæ thickened, straight. Immediately behind them a spiniform pair. The humeral setæ are large and clavate; in a line with them two clavate setæ on each side and between these a pair of spiniform setæ. A series of four clavate setæ follow these; the rest of the scutum is bare, except for three pairs of spiniform setæ near the middle line, the third pair on the posterior margin. No other marginal setæ, but the body-margin bears a series of curved spiniform setæ.

The epistome is peculiar, but probably is of the form proper to this subgenus, though stimulating that of *Macrocheles*, s.s. The epistomal margin is very finely denticulate. The base of the crest looks lamellar, but is probably only an unusually broad furcate seta with a linear one superposed.

There are a few clavate setæ on the legs, which are otherwise normal, except that my specimen shows a peculiar dorsal seta near the apex of tarsus iv.—thick and nude below, fine and plumose above: but I doubt the constancy of this.

West Allendale, in moss.

Macrocheles marginatus, Herm.

So long as the rival claimants to this name belonged to the same group a final decision between the two was not urgent; but the dividing of *Macrocheles* into subgenera brings the matter to a head. For *M. marginatus*, Herm.-Berl., and *M. marginatus*, Herm.-Oud., cannot be placed in the same subgenus, and *marginatus*, Herm., being the type of *Macrocheles*, Latr., the specific name carries the generic with it. For several reasons it seems best to me to accept the allocation of the Italian acarologists; and, indeed, one of them—that Dr. Berlese is our leading systematist—is perhaps sufficient in itself.

M. marginatus, Herm.-Berl., is not a British species, and the species I have hitherto called *marginatus*, Herm., does not appear to occur in Italy. Three changes are necessary: the British species requires a new specific name; Falconer's *Dissoloncha* is replaced by *Macrocheles*; and his subgenus *Macrocheles* must be renamed. For the last I now propose the name *Monoplites*.

Macrocheles (*Monoplites*) *oudemansii*, nom. nov.
(for *M. marginatus*, Herm.-Oud.).

This species remains the type of the subgenus now to be called *Monoplites*, in which the male has spurs on the second pair of legs only, and the female has a more or less cordiform ventro-anal scutum well separated from the genital.

30. *Macrocheles* (*Monoplites*) *palustris*, sp. n.

(Pl. XIX.)

Length of male 1100 μ; of female 1200 μ.

Both sexes resemble *oudemansii* very closely, even to the reticulation of the scuta and the setæ of tarsus iv. The ventro-anal scutum of the female is of the same form but larger.

The only clavate setæ are the humeral and vertical. The rest are all hyaline and spiny. The longest are two submarginal just in front of the shoulder. The margins of the body and of the dorsal scuta bear series of the same character.

There are a few small clavate setæ on the proximal articles of the legs, and a much larger one which stands out prominently on the anterior side of tarsus i.—a very useful recognition-mark.

In sphagnum on the moors, West Allendale.

31. *Macrocheles* (*Monoplites*) *tardior*, sp. n.

(Pl. XIX.)

Length of female 1000 μ. Male unknown.

Form of body and dorsal scutum of the ordinary type. No clavate setæ on the body or scuta except the humeral—even the vertical are only a very little thickened. The rest are all short spiniform—a pair behind the vertical; four in a transverse line between the humeral; the usual marginal series on body and dorsal scutum, and on the latter a similar submarginal series.

The scuta—dorsal and otherwise—all show the same reticulations of the usual areolate character formed by minute ridges (which are much reduced on the genital scutum). The surface within the areolations is densely pitted—more sparsely on the genital scutum.

The legs have a few seriate clavate setæ, mostly dorsal and postero-lateral.

The ventral scuta of the female are quite unusual in this subgenus and would be most natural in *Nothrholaspis*; but the sternal scutum, epistome, and legs combine to give it a place here.

Oxfordshire (*R. S. Bagnall*). Habitat not stated.

87. *Macrocheles pluminventris*, sp. n.

(Pl. XIX.)

Length of female 1300 μ; breadth 960 μ.

Body oval, with quadrate prodorsum. Colour in life chestnut-brown. The dorsal scutum is divided into three regions more or less distinct, varying in their sculpture. The fore part is roughly elliptical, with the humeral setæ at the ends of the longer diameter. Its surface is irregularly rugose with faint traces of pitting, which become more definite in the very centre. Between the humeral setæ and a little in advance of them are two pairs of similar clavate setæ, and two other pairs mark the posterior boundary of this forward area.

The rest of the scutum is regularly and beautifully reticulate and punctate all round the margin (mesh about 60 μ), leaving a lunate centre, wrinkled and indistinctly reticulate with meshes of much smaller size. My specimen shows no setæ of any kind on this posterior part of the scutum, but the adjacent body-margin bears a regular series of small setæ, curved (almost hooked) and thickened.

The second pair of legs is considerably stouter than the rest, the first pair being quite slender. The joints are mostly rugged, but there are no actual tubercles or spurs. All the legs have a few postero-lateral setæ of the same form as those on the body-margin.

The genital scutum is trapezoid with strongly chitinous raised margins, stoutest at the sides, from each of which issues a broad branch in front and a slender one in the middle. A few finer ridges intervene and the surface is irregularly punctate. The sternal scutum is quite regularly reticulate and punctate, and extends to coxa iv., bearing a clavate seta on each side of the genital scutum. In form the ventro-anal scutum is a sort of widened hexagon with the two posterior angles rounded off, so that the hind margin is an unbroken curve. At this curved part there is a narrow smooth border, above which the rest of the surface is slightly raised. This inner area is beautifully reticulate and punctate like the posterior border of the dorsal scutum. It is bounded on each side in front by an oblique chitinous ridge. Its most singular feature is that it bears three pairs of clavate setæ.

The male unfortunately is unknown, but I assign the female confidently to *Macrocheles* (sensu stricto) because of the character of the dorsal scutum, the relative thickness of the legs, and the form of the ventro-anal scutum. This last is of much the same form as that of the type-species—*marginatus*, Herm.-Berl.,—which is one-fourth larger and differs altogether in chætotaxy and sculpture of scuta.

My solitary example was taken in a manure-heap in West Allendale.

32. *Sphærolælaps holothyroides*, Leon.
(Pl. XVIII.)

Length of male 1000 μ ; width 760 μ.

Body obovate, considerably narrower behind than the female. Dorsal scutum leaving a narrow nude margin in front of the third pair of legs, and from that point to a point near the anal extremity deflexed to the ventral surface, the deflexed margin being nearly parallel to the margin of the ventral shield ; its surface faintly reticulate in fairly large mesh, each roughly rhomboidal, wider than long. Colour apparently pale yellow-brown.

Dorsal setæ long, curved, fairly stout ; five median converging pairs (including the vertical), the second and third overlapping, and between a short row of four lesser setæ, the rest parallel or divergent. The posterior four pairs similar to the dorsal, the anterior rather smaller. First and fourth legs longest, about equal ; second and third equal, the former a little thicker than the rest, the femur with a blunt spur bent almost at a right angle, next joint with two tiny tubercles, the distal the larger, the following joint with one at the middle very small. Setæ of femur ii. short and vertical, those of the genu similar. The rest of the leg-setæ normal, rather weak, except those of the tarsus which are a little larger and more rigid (especially of tarsus iv., on which there are four pairs).

Ventral scutum undivided, including the straight peritreme, concavely narrowed towards the anus, which it just includes ; reticulate like the dorsal. All the legs inserted on the forward half of the venter.

Boxhill, Surrey ; with *Lasius mixtus* (*W. C. Crawley*). Previously the female only was known.

EXPLANATION OF THE PLATES.

Plate XVI.

Fig. 1. *Urodiaspis persimilis*, female ; *a*, epigyne.
Fig. 2. *Urodiaspis anomalus*, female ; *a*, epigyne.
Fig. 5. *Urobovella obovata*, nymph, upperside ; *b*, underside.
Fig. 7. *Urodiscella signata*, female, dorsum.
Fig. 10. *Eulælaps affinis*, female, ventral scuta.
Fig. 15. *Læliphis fuscipes*, female, underside ; *a*, male, part of ventral scutum.
Fig. 21. *Hypoaspis soricinus*, male, underside ; *b*, reticulations of dorsal scutum.
Fig. 24. *Macrocheles pannosus*, female ; *a*, genital and anal scuta.
Fig. 25. *Macrocheles matrius*, female ; *a*, ventral scuta.
Fig. 33. *Urodinychus winterii*, female ; *a*, epigyne.

Fig. 34. *Urodinychus viduus*, female, underside.
Fig. 35. *Urodinychus biquadratus*, female; *a*, peritreme.
Fig. 36. *Urodinychus similis*, female; *a*, epigyne.

PLATE XVII.

Fig. 3. *Uropoda berniciensis*, female; *a*, epigyne.
Fig. 4. *Uropoda corticalis*, female; *a*, epigyne.
Fig. 6. *Uroplitella donisthorpii*, female; *a*, epigyne and part of ventral scuta; *b*, peritreme.
Fig. 8 *Prodinychus delectus*, female; *a*, epigyne.
Fig. 9. *Antennophorus foreli*, male; *a*, mandible; *b*, stigma, with longitudinal section of part of the peritreme and indications of some tracheal ramifications.
Fig. 40. *Prodinychus longiforis*, female; *a*, underside.

PLATE XVIII.

Fig. 12. *Lasioseius cristatus*, female; *a*, dorsal seta; *b*, vertical seta.
Fig. 13. *Lasioseius jugatus*, female.
Fig. 14. *Ameroseius sulcatus*, female.
Fig. 16. *Læliphis birksianus*, female, ventral scuta.
Fig. 17. *Androlælaps hermaphrodita*, female, underside; *a*, part of a second leg.
Fig. 18. *Hypoaspis latifrons*, female, underside; *a*, mandible.
Fig. 19. *Hypoaspis compressus*, female, underside.
Fig. 20. *Hypoaspis soarianus*, female, underside.
Fig. 22. *Hypoaspis fucorum*, male, underside.
Fig. 32. *Sphærolælaps holothyroides*, male; *a*, underside.

PLATE XIX.

Fig. 26. *Macrocheles nemoralis*, female; *a*, sternal scutum; *b*, genital and anal scutum.
Fig. 27. *Macrocheles occidentalis*, female; *a*, crest of epistome.
Fig. 28. *Macrocheles parmulatus*, female; *a*, ventral scuta.
Fig. 29. *Macrocheles gloriosus*, male; *a*, crest of epistome.
Fig. 30. *Macrocheles palustris*, male, tarsus i.
Fig. 31. *Macrocheles tardior*, female; *a*, genital and anal scuta; *b*, crest of epistome.
Fig. 37. *Macrocheles plumiventris*, female; *a*, genital and anal scuta.

XXV.—*Notes on some Indian Bees in the British Museum.*

By CEDRIC DOVER.

I HAVE recently had the opportunity of examining the large collection of Oriental and other bees in the British Museum (Natural History), and the following preliminary notes on some Indian species in this collection appear to merit publication. Most of the synonymy given in this note has not been hitherto published. I have also included the names of some well-known Palæarctic forms new to the Indian region, and the descriptions of four species which seem to me to be undescribed. The Andreninæ and certain other groups will be dealt with later. It must be mentioned that some of the synonymy published here was originally indicated on the labels attached to the species by the late Mr. G. Meade-Waldo or Lt.-Col. C. G. Nurse, whose labours, both as a collector and a scientific worker on the Indian Aculeata, have done so much to further their study. Col. Nurse has been a little unfortunate in that the Palæarctic element, especially that of Turkestan, is very marked in the bees of the Himalayas and Western India.

I am indebted to Prof. T. D. A. Cockerell for reading through the MS. of this paper and suggesting certain corrections, and to the authorities of the Department of Entomology for permission to study the collections in their care.

SPHECODINÆ.

Sphecodes gibbus, Linn.

1758 *Sphex gibba*, Linn., Syst. Nat. ed. 10*a*, i. p. 571.
1896. *Sphecodes gibbus*, Linn., Dalla Torre, Cat. Hym. x p. 5.
1919. *Sphecodes gibbus*, Linn., Meyer, Arch. fur Nat. lxxxv. A, p. 109.
1853 *Sphecodes apicatus*, Smith (nec Bingham and Meyer), Cat. Hym Brit. Mus. i. p. 36 (♀).
1903. *Sphecodes sutor*, Nurse, Ann & Mag. Nat. Hist. (7) xi. p. 53 (♀).

Indian Distribution. Quetta; Simla; Kashmir, 5000–6000 ft.; Pegu hills; "India."

Nurse separated his species from *S. apicatus*, Smith, because he understood it to have the mesonotum closely punctured, while his insect had the mesonotum sparsely punctured, but a comparison of the types showed that this distinction was not valid. Mr. P. Blüthgen found that a paratype of *S. sutor*, which he had received from the U.S. National Museum, was undeniably synonymous with typical female examples of *S. gibbus*, and suggested that I should institute a further comparison with the specimens in the British Museum. From this examination I am convinced that the three names are synonymous. Mr. Blüthgen considers that the species described by Bingham under the name *S. apicatus* is really quite distinct, and proposes to rename it in an early issue of the Deuts. Ent. Zeitschrift.

Sphecodes crassicornis, Sm.

1870. *Sphecodes crassicornis*, Smith, Descrip. New Spec. Hym. Brit. Mus. p. 28 (♂).
1919. *Sphecodes crassicornis*, Smith, Meyer, *loc. cit.* p. 220 (♂).

1879. *Sphecodes sodalis*, Smith, *tom. cit.* p. 28 (♂).
1903. *Sphecodes abuensis*, Nurse, *loc. cit.* p. 539 (♂ ♀).

Indian Distribution. Mt. Abu; Bombay (? city); Calcutta; Colombo.

This species is somewhat variable, but a good character is found in the pubescent bands on the antennæ, which are identical in all the specimens under the above three names in the British Museum. The type of *S. sodalis* still bears Smith's MS. name *S. basalis*, which appears to have been changed to *S. sodalis* by the editors of his posthumous work as it is preoccupied.

Sphecodes crassus, Thoms.

1870. *Sphecodes crassus*, Thomson, Opusc. Entom. ii. p. 100 (♀, not ♂)
1882. *Sphecodes divisus*, Hagens, Deuts. Ent. Zeitschr. xxvi. p. 223, pl. vii. fig. 16 (♂ ♀).
1874. *Sphecodes variegatus*, Hagens, Verh. naturh. Ver. preuss. Rheinl. xxvi. p. 68 (♂).

Indian Distribution. Quetta.

I am indebted to Mr. Blüthgen for this and the following record.

Sphecodes fuscipennis, Germ.

1819. *Dichroa fuscipennis*, Germar, Faun. Insect. Europe, pt. 5, tab. xviii.
1896. *Sphecodes fuscipennis*, Germar, Dalla Torre, *tom. cit* p. 4.
1922. *Sphecodes grandis*, Meyer, Arch. für Nat. lxxxviii. A, p. 173.

Indian Distribution. Quetta.

Mr. Blüthgen regards *S. rubripes*, Spinola, as a subspecies of this insect.

Sphecodes olivieri, Lepel. & Sev.

1825. *Sphecodes olivieri*, Lepeletier, Encycl. Méthod., Insect. x. p. 448 (♂).
1903. *Sphecodes desertus*, Nurse, *loc. cit.* p. 540.
1911. *Sphecodes chionospilus sanguinatus*, Cockerell, Trans. Amer. Ent. Soc. xxxvii. p. 217.
1922. *Sphecodes tenuis*, Meyer, *loc. cit.* p. 121 (♂).

Indian Distribution. Mt. Abu; Deesa; Bombay Presidency; Quetta; Peshin, Baluchistan; Karachi.

Mr. Blüthgen supposes that typical *S. chionospilus*, Ckll., is also a synonym of this species, but it differs markedly in the colour of the legs and in the abdomen being more strongly punctured, and seems to me to be distinct, at least varietally.

Sphecodes pellucidus, Sm.

1845. *Sphecodes pellucidus*, Smith, Zoologist, iii. p. 1014 (♂).
1917. *Sphecodes pellucidus*, Smith, Perkins, Ent. Mo. Mag. (3) iii. p. 73 (synonymy).

Mr. Blüthgen found a female of this species from Simla among material of *S. montanus* in the British Museum. He thinks that the sexes of *S. montanus* may represent distinct species and that they may be synonymous with some Palæarctic form.

Sphecodes puncticeps, Thoms.

1870. *Sphecodes puncticeps*, Thomson, Opusc. Ent. ii. p. 99.

Indian Distribution. Quetta.

PROSOPIDINÆ.

Prosopis brevicornis, Nylander.

1852. *Hylæus brevicornis*, Nylander, Notis. Saellsk. Faun. Fl. Fenn Forh. ii. (Suppl.) p. 95.
1896. *Prosopis brevicornis*, Nyland., Dalla Torre, *tom. cit.* p. 17.
1903. *Prosopis kashmirensis*, Nurse, *loc. cit.* p. 534.

Nurse's examples are from Kashmir, 6000–8000 ft.

Prosopis secreta, Nurse.

1903. *Prosopis secreta*, Nurse, *loc. cit.* p. 537 (♂).
1903. *Prosopis advocata*, Nurse, *loc. cit.* p. 537 (♀).

Indian Distribution. Kashmir, 5000–6000 ft.

XYLOCOPINÆ.

Xylocopa fenestrata iridipennis, Lepel.

1841. *Xylocopa iridipennis*, Lepeletier, Hist. Nat. Ins. Hym. ii. p. 188 (♀).
1912. *Xylocopa iridipennis*, Lepeletier, Maidl., Ann. Nat. Hofmus Wien, xxvi. p. 287.

I consider this form and the one following to be varieties of *X. fenestrata*, differing in the colour of the wings.

Xylocopa fenestrata auripennis, Lepel.

1841. *Xylocopa auripennis*, Lepeletier, *tom. cit.* p. 181.
1922. *Xylocopa auripennis*, Lepeletier, Dover, *loc. cit.* p. 86.
1897. *Xylocopa dissimilis*, Bingham (nec Lepel.), Faun. Brit. Ind., Hym. i. p. 538.

The following Indian localities are not recorded by

Bingham (*tom. cit.* p. 538):—Darjiling, 2000 ft.; Dibrugargh, Sibsagar, Khasi Hills and Naga Hills, Assam; Bangalore; Madras; Ceylon; Nepal.

Xylocopa ignita sigiriana, Ckll.

1911. *Xylocopa amethystina sigiriana*, Cockerell, Ann. & Mag. Nat. Hist (8) vii. p. 310.
1919. *Xylocopa sigiriana*, Cockerell, Ann. & Mag. Nat. Hist. (9) iii. p. 193.

Indian Distribution. Sigiri, Trincomalee and Periakulam, Ceylon; Bariwli, Bombay Presidency; Bababuddin Hills, Mysore.

Maidl has shown (*loc. cit.* p. 291) that *X. amethystina* as described by Bingham (*tom. cit.* p. 540) is distinct from the Fabrician species and is synonymous with Smith's *X. ignita.* I do not think Prof. Cockerell is right in regarding his form as distinct from *X. ignita.*

Xylocopa æstuans, Linn.

1758. *Apis æstuans*, Linn. Syst Nat. ed. x. i. p 579 (♀).
1897. *Xylocopa æstuans*, Linn., Bingham, *tom. cit* p 540.
1924. *Xylocopa æstuans*, Linn., Dover, Trans Ent. Soc. Lond. p. 114 (bionomics, etc.).
1901. *Xylocopa confusa*, Pérez, Act. Soc. Linn. Bordeaux, (6) vi. p. 57.
1912. *Xylocopa confusa*, Pérez, Maidl, *loc. cit.* p. 297, figs. 28, 29, pl. iv. fig. 13.
1773. *Apis leucothorax*, De Geer, Mem. Hist. Ins. iii. p. 573, pl. xxviii. fig. 7.
1912. *Xycolopa leucothorax,* De Geer, Maidl, *loc cit.* pp. 261 & 277, fig. 16.
1793. *Apis bryorum* Fabr. Syst. Ent. ii. p. 321 (♂).
1897. *Xylocopa bryorum*, Fabr., Bingham, *tom. cit.* p. 541.
1912. *Xylocopa bryorum*, Fabr., Maidl, *loc. cit.* p. 298, figs. 31, 32.
1921. *Xylocopa bryorum*, Fabr., Hacker, Mem. Queensland Mus. vii p. 159.

As I have said elsewhere (1924) I do not think that Pérez's separation of Indian specimens from African ones under the specific name *confusa* is valid, nor do I think that *X. bryorum* is specifically distinct. I imagine that other species of the *æstuans* group, such as *X. verticalis*, *X. vachal*, and *X. separata* may also be regarded as synonyms, or at most as varieties or races, of *X. æstuans* in the future, but on this point I can express no opinion. The species occurs continuously from East Africa through Ceylon and South India, to North India, Burma, the Malayan region, and Australia, and there appears to be some justification for regarding the Indian, African, and Australian specimens as representing distinct geographical races. Linnæus mentions the distribution of this species as "*habitat in regionibus calidis*," and if the latter arrangement be adopted reference would have to be made to the Linnean type in (?) Stockholm, before definite names could be given to the various races.

Xylocopa olivieri rufa, Friese.

1901. *Xylocopa olivieri*, var. *rufa*, Friese, Die Bienen Europas, vi. p. 221.

Col. Nurse took a large series of this form at Quetta. He informs me that, like *X. tranquebarica*, Fabr. (=*rufescens*, Sm.), it is entirely crepuscular in its habits, and in Quetta is quite common at dusk. It used to frequent hollyhock-flowers in his garden in large numbers, and was also probably the cause of a good deal of damage to the willow-trees bordering many of the streams in that district. Prominent ocelli seem to be a character common to crepuscular bees (*cf.* Cockerell, Amer. Mus. Nov., No. 66, 1923), and it is interesting to note that in Col. Nurse's examples this is quite evident.

Xylocopa collaris nigrocærulea, Sm.

1874. *Xylocopa nigrocærulea*, Smith, Trans. Ent. Soc. Lond. p. 229 (♀).
1912. *Xylocopa nigrocærulea*, Smith, Maidl, *loc. cit.* p. 292.

The British Museum has specimens from the following localities:—Andaman Islands; Kandy, Trincomalee, Pundaloya, Badegamma, Ceylon; Albay, S.E. Luzon; Tondano, Celebes (type).

The late Mr. Meade-Waldo attached a label to the specimens in the British Museum indicating that he thought the form ought to be a subspecies of *X. collaris*, and I think this arrangement is correct. The male is very like that of the *forma typica*, but is readily distinguished by the reddish-ochraceous colour of the frons and of the marking on the scape, and by the absence of white pubescence on the former. *X. collaris binghami*, Ckll. (Ann. & Mag. Nat. Hist. (7) xiv. p. 30, 1904), appears to be only a dimorphic male of the typical form. *X. madurensis*, Friese (Deuts. Ent. Zeitschrift. p. 88, 1913), of which I have identified two examples from the type-locality, I consider a variety of *X. collaris*. The Indian forms of *X. collaris* may be separated as follows:—

1. (*a*) Scape of antennæ ochraceous or reddish ochraceous .... 2.
   (*b*) Scape of antennæ black............ *X. collaris madurensis.*

2. (*a*) Face yellowish white with white pubescence	3.
(*b*) Face reddish ochraceous, without pubescence	*X. collaris nigrocærulea.*
3 (*a*) Pubescence covering entire mesonotum	*X. collaris binghami* (♂).
(*b*) Pubescence not covering entire mesonotum	*X. collaris* (typical form)

ANTHOPHORINÆ.

Tetralonia duvaucelii, Lepel.

1841. *Macrocera duvaucelii*, Lepeletier, Hist. Nat. Ins. Hym. ii. p. 98 (♂).
1897. *Tetralonia duvaucelii*, Lepel., Bingham, *tom. cit.* p. 520, fig. 175 (♂).
1909. *Tetralonia duvaucelii*, Lepel., Cameron, Deuts. Ent. Zeits. p. 49 (♀).
1909. *Tetralonia erythrocera*, Cameron, *loc. cit.* p. 49 (♂).

Indian Distribution. Kumaon; Bombay; Quetta; Ferozepore; Akalgargh, Punjab; Multan.

Tetralonia ruficornis, Fabr.

1804. *Eucera ruficornis*, Fabr Syst. Piez. p. 383.
1896. *Eucera ruficornis*, Fabr., Dalla Torre, *tom. cit.* p. 245.

Indian Distribution. Deesa; Mt. Abu; Ataran Valley, Tenasserim.

This record is based on specimens in the British Museum under the name *T. brevipennis*, Cameron, which, I believe, belong more properly to the Palæarctic *T. ruficornis.* Cameron's (?) type, however, in the Oxford Museum, is considered by Prof. Cockerell to be a *Habropoda.*

Tetralonia spectabilis, Mor.

1875. *Tetralonia spectabilis*, Morawitz, in Fedtschenko's Reise in Turkestan, Apid. i. p. 48.
1909. *Tetralonia testaceitarsis*, Cameron, Deuts. Ent. Zeits. p. 49 (♂).
1909. *Tetralonia punctilabis*, Cameron, *loc. cit.* p. 48 (♀).
1909. ? *Tetralonia rufolineata*, Cameron, *loc. cit.* p. 50 (♀).
1920. "*Tetralonia punctilabris*, Cam.," Cockerell, Ann. & Mag. Nat. Hist. (9) vi. p. 206.

Indian Distribution. Ferozepore; Quetta; Peshawar.

I cannot separate *T. testaceitarsis* and *T. punctilabis* from he Turkestan species, but *T. rufolineata* is a somewhat rger form, the thoracic pubescence is more dense and more onspicuously tinted with fulvous, and the lower margin of e clypeus is dark red, but this latter is not a very imortant character. A characteristic W-shaped mark on the underside of the abdomen is common to all the specimens of the three Cameronian "species," and the clypeal structure is also similar. Cockerell's record (1920) is evidently a *lapsus* for *punctilabis*, Cam.

Tetralonia vernalis, Mor.

1875. *Tetralonia vernalis*, Morawitz, *loc. cit.* p. 54.
1904. *Eucera pomona*, Nurse, Journ. Bomb. Nat. Hist. Soc. xv. p. 580.

Indian Distribution. Quetta.

Tetralonia phryne, Nurse.

1904. *Eucera phryne*, Nurse, *loc. cit.* p. 579.
1922. *Tetraloniella phryne*, Nurse, Cockerell, Ann. & Mag. Nat. Hist. (9) ix. p. 362.
1908. *Tetralonia glabricornis*, Cameron, Journ. Bomb. Nat. Hist. Soc. xviii. p. 649 (♂).
1920. *Tetralonia glabricornis*, Cameron, Cockerell, Ann. & Mag. Nat. Hist. (9) vi. p. 205.
1908. *Tetralonia ovatula*, Cameron, *loc. cit.* p. 649 (♀).
1898. *Tetralonia punctata*, Cameron, Mem. Manch. Soc. xlii. p. 79.
1920. *Tetralonia leucopoda australior*, Cockerell, *loc. cit.* p. 205.

Indian Distribution.* Deesa and Bariwli, Bombay Presidency; Jubbulpore; Lyallpur.

Friese considers this species a variety of *T. dentata*, Klug, but I think Prof. Cockerell is right in regarding it as distinct.

Tetralonia nursei, Ckll.

1922. *Tetraloniella graja nursei*, Cockerell, Ann. & Mag. Nat. Hist. (9) ix. p. 361.

This form seems to me to be very distinct from either *T. graja* or *T. dentata*, and I propose for the present to raise it to specific rank. It also seems feasible to suppose that Friese's race *syriaca* is specifically distinct from *T. graja* and that *T. nursei* from Quetta is an Indian race.

Tetralonia graja, Evers.

1852. *Macrocera graia*, Eversmann, Bull. Soc. Nat. Mos. xxv. p. 124 (♂).
1896. *Eucera graja*, Evers., Dalla Torre, *tom. cit.* p. 234.
1922. *Tetraloniella dentata macrozona*, Cockerell, *loc. cit.* p. 362 (♀).

I have carefully compared the series of specimens from Quetta, from which Prof. Cockerell selected his type, with supposedly typical *T. graja* from Albania, and am convinced that they are synonymous. In *T. graja* ♀ there is a more or less triangular projection from the upper margin of the yellow clypeal marking, and this is angularly incised on each side, while in *T. dentata* ♀ there is no such marking, and the upper margin is only slightly rounded. Prof. Cockerell's insect has the characteristic clypeal marking of *T. graja*.

Tetralonia metallescens, Mor.

1888. *Tetralonia metallescens*, Morawitz, Hor. Soc. Ent. Ross. xxii. p. 233.

1909. ? *Tetralonia claripennis*, Cameron, Deuts. Ent. Zeits. p. 51 (♂).

I do not think Cameron's specimens from Ferozepore can be separated from *T. metallescens*.

Tetralonia krishna, sp. n.

♂. Black: vertex finely punctured, not pubescent; genæ and supraclypeal area with white pubescence; antennæ uniformly black, not reaching to the apex of the abdomen; clypeus yellow, fairly strongly pitted, apex brown; labrum yellow, covered with long white pubescence; mandibles black; thorax with white pubescence, almost absent on the disc, which is pitted and finely granular; abdomen pitted and finely granulated, not pubescent, posterior margins and segments dark reddish brown; femora with white pubescence; tibiæ and tarsi with ferruginous pubescence; wings hyaline, tegulæ and nervures brownish.

Length about 12 mm.

Habitat. Quetta (*C. G. Nurse*, May 1903).

This species is superficially like *T. himalayensis*, but that species has the clypeus black. It differs from *T. vernalis* in the lack of abdominal pubescence. It is closely allied to *T. chinensis*, Smith, from Shanghai, but Smith's insect has the thoracic pubescence fulvous, and the antennæ reach to the apex of the abdomen. The specific name is derived from Sanskrit word meaning "black."

Tetralonia pitalomasa, sp. n.

♂. Black: vertex, frons, and genæ with white pubescence, thicker on the latter, the vertex and frons finely punctured; eyes pale green; scape black, flagellum rufous; clypeus creamy-yellow, smooth and shining, except at the edges where there are a few hairs arising from shallow pits, ⊥-shaped, the vertical column broad and slightly rounded at the upper margin, the basal portion broader than the upper, lower margin transverse; labrum of same colour, covered with white pubescence; mandibles brownish black, yellow basally, fringed with ferruginous hairs; thorax covered with white pubescence, that on the disc being almost fulvous; disc finely granulose; abdomen finely and very closely punctured with tawny hairs arising from these punctures, appearing to the naked eye to be covered with tawny pile; posterior margin of segments brownish ochraceous with the pubescence in this area considerably thicker; legs covered with white pubescence, that on the inner side of the tarsi being mixed with ferruginous; wings hyaline, tegulæ testaceous, nervures brownish testaceous.

♀. The pubescence on the abdomen thicker and closer, the ochraceous colour of the posterior margins of the segments just showing through; clypeus with a transverse yellow marking, and a triangular prolongation from the upper margin, somewhat angularly incised at the sides of this notch. In one specimen two circular areas beneath these incisions remain black.

Length: ♂ about 8 mm., ♀ about 9 mm.

Habitat. Peshin, Baluchistan; Quetta.

This species was labelled in the British Museum as "*? radoszkowskii*," but the only male of this insect that I have seen has the clypeus distinctly punctured and the outer side of the flagellum black; it is also distinctly larger. The smooth clypeus and the nature of the abdominal pubescence distinguish it from *T. ruficornis* and *T. aliena*. It bears a certain superficial resemblance to *T. pruinosa*, but that species belongs to the genus *Tetralonia* (sensu stricto), while our insect belongs to the subgenus *Tetraloniella*. The specific name is derived from the two Sanskrit words *pita* and *loma*, meaning "yellow" and "hair" respectively.

Tetralonia pitarakha, sp. n.

♂. Black: vertex, frons, and genæ with fairly thick whi pubescence; antennæ uniformly black; eyes dark green; clypeus yellow, closely, but not strongly pitted, more or less triangular in outline, upper margin truncate, lower margin brownish; labrum yellow, covered with white hairs; mandibles black with a narrow ochraceous line on the outer side apically; thorax with thick white pubescence, that on th mesonotum being distinctly mixed with fulvous; abdomen with fine punctures, from some of which minute hairs aris the segments posteriorly with uniform bands of creamy ochraceous pubescence; legs (damaged in the type) wit white pubescence on the outer side, that on the femora o the first pair being distinctly horizontal; wings hyaline, tegulæ testaceous, nervures brownish.

Length about 12 mm.

Habitat. Quetta (*C. G. Nurse*, April 1904).

This species appears to be closely allied to *T. spectabilis*, from which it differs in the distinctly ochraceous colour of the abdominal fasciæ, the triangular, posteriorly truncated clypeus, and the absence of a basal yellow marking on the mandibles. The specific name means "yellow-striped."

Anthophora candida, Sm.

1879. *Anthophora candida*, Smith, New Sp. Hym. Brit. Mus. p. 122 (♀).
1897. *Anthophora candida*, Smith, Bingham, Faun. Brit. Ind., Hym. i. p. 531.
1845. *Megilla mucorea*, Klug (nec Illig., 1806), Symb. Physic. Ins. ix. figs. 13 & 14.

Indian Distribution. Karachi; Quetta; Peshawar; Peshin, Baluchistan.

Anthophora fasciata alternans, Klug.

1845. *Megilla alternans*, Klug, *tom. cit.* pl. 1. fig. 3 (♀).
1898. *Anthophora liriope*, Bingham, Journ. Bomb. Nat. Hist. Soc. xii. p. 127.
1911. *Anthophora delicata*, Cockerell, Entomologist, xxxiv. p. 235.

Indian Distribution. Deesa; Quetta; Karachi; Peshawar.

Anthophora antiope, Bingh.

1898. *Anthophora antiope*, Bingham, Journ. Bomb. Nat. Hist. Soc. xii. p. 128.
1901. *Podalirius violettus*, Nurse, Journ. Bomb. Nat. Hist. Soc. xv. p. 582.

Indian Distribution. Kashmir, 5000–6000 ft.; Quetta; eshin; Baluchistan; Simla.

Friese seems to consider this form (*vide* label in Brit. s.) a variety of *A. retusus*, Linn., but it appears to be tinct.

*N*OMADINÆ.

Melecta luctuosa, Scop.

0. *Apis luctuosa*, Scopoli, Ann. Hist. Nat. iv. p. 13.
6. *Melecta luctuosa*, Scop., Dalla Torre, *tom. cit.* p. 315.
8. *Crocisa kashmirensis*, Nurse, Ann. & Mag. Nat. Hist. (7) xi. p. 548 (♀).

ian Distribution. Quetta; Peshin, Baluchistan; Kashmi 5000–6000 ft.

MEGACHILINÆ.

Heriades phaola, Cam.

1908. *Megachile phaola*, Cameron, Journ Bomb. Nat. Hist Soc xvii p 1005

In the British Museum *H. saphira* and *H. lefroma*, Cam. (originally described in *Megachile*, loc. cit.), are placed as synonyms of this species on the authority of Friese and Meade-Waldo, but I find it difficult to accept this synonymy. They can be easily distinguished as follows.—

1. (*a*) With black legs, eyes broadly divergent towards vertex . . . . *H. lefroma.*
(*b*) With red legs, eyes not so divergent . . . 2
2 (*a*) Basal abdominal segment black . . . . *H. saphira*
(*b*) Basal abdominal segment ferruginous . . . . *H. phaola.*

Megachile pulchripes, Cam. (*cf.* Cockerell, Ann. & Mag. Nat. Hist. (9) viii. p. 366, 1921), is given as a synonym of *H. lefroma* on the label attached to the specimens of the latter species, but, as I have seen no specimens of the former, I can express no opinion on this point.

Heriades binghami, nom. n.

1898 *Heriades parvula*, Bingham (nec Cam., 1897), *tom. cit.* p. 508.

Megachile parvula, Cam. (Mem. Manch. Soc. p. 185, 1897), is, according to a label attached to the type by Prof. Cockerell, a *Heriades*. Bingham's species, therefore, requires a new name.

Megachile nigriventris, Schenck.

1870 *Megachile nigriventris*, Schenck, Jahrb ver. Nat Nassau, xx[illegible] xxv p 324.
1911 *Megachile nigriventris*, Schenck, Friese, *tom cit.* p. 192.
1874 *Megachile maacki*, Radoszkowski, Bull. Soc. Nat. Mos x[illegible] p. 135
1911. *Megachile maacki*, Radoszkowski, Friese, *tom. cit.* p. 224

Indian Distribution. Gulmarg, Kashmir (*F. W. Thomson*).

Megachile lagopoda, Linn.

1761. *Apis lagopoda*, Linn Faun Suec. ed. 2*a*, p. 422.
1911. *Megachile lagopoda*, Linn, Friese, *tom cit.* p. 193.

Indian Distribution. Gulmarg, Kashmir (*F. W. Thomson*).

Megachile argentata, Fabr.

1793. *Apis argentata*, Fabricius, Ent. Syst. ii. p. 336.
1911. *Megachile argentata*, Fabr., Friese, *tom. cit.* p. 176.

Indian Distribution. Matheran; Mt. Abu; Quetta; Lahore; Sikhim, 1800 ft.

Megachile schnablii, Rad.

1893. *Megachile schnablii*, Radoszkowski, Hor. Soc. Ent. Ross. xxvii. p. 47.
1911. *Megachile schnablii*, Radoszkowski, Friese, *tom. cit.* p. 187.

Indian Distribution. Quetta.

Megachile terminata, Mor.

1875. *Megachile terminata*, Morawitz, *loc. cit.* p. 113.
1911. *Megachile terminata*, Morawitz, Friese, *tom. cit.* p. 181.

Indian Distribution. Quetta. *M. ulrica*, Nurse, is not a synonym of this species as Cockerell supposed (Proc. U.S. Nat. Mus. lv. p. 214, 1920).

Megachile rotundata, Fabr.

1787. *Apis rotundata*, Fabricius, Mant. Ins. i. p. 303.
1911. *Megachile rotundata*, Fabr., Friese, *tom. cit.* p. 178.
1898. *Megachile cœlioxysides*, Bingham, Journ. Bomb. Nat. Hist. Soc. xii. p. 126 (♀).
1902. *Megachile cœlioxysides*, Bingham, Nurse, Journ. As. Soc. Beng. lxx. p. 150 (♂).
1908. *Megachile cœlioxysides*, Bingham, Cameron, Journ. Bomb. Nat. Hist. Soc. xviii. p. 652.
1902. *Megachile ulrica*, Nurse, *loc. cit.* p. 157 (♀).
1903. *Megachile nadia*, Nurse, Ann. & Mag. Nat. Hist. (7) xi. p. 546.
1908. *Megachile gathela*, Cameron, *loc. cit.* p. 650.
1923. *Megachile gathela*, Cameron, Cockerell, Ann. & Mag. Nat. Hist. (9) xii. p. 249.

Indian Distribution. Matheran; Quetta; Karachi; Deesa; Kangra Valley; Murree–Kashmir Road, 1400–1500 ft.; Mt. Abu; Pusa; Adderley, Nilgiris.

Prof. Cockerell has pointed out that Cameron's *M. gathela* is not synonymous with his *M. nana*, but is very close to *M. cœlioxysides*, Bingham, which I cannot separate from the European examples of *M. rotundata* named by Friese. I have compared *M. gathela* with *M. cœlioxysides* and *M. rotundata* and am convinced that they are synonymous. In the British Museum, *M. katinka*, Nurse, is placed as a synonym of *M. venusta*, Smith, an African species with the label "teste Friese," but there is no doubt that *M. katinka* is a synonym, as Meade-Waldo supposed of *M. hera*, Bingham.

Anthidium fedtschenkoi, Mor.

1875. *Anthidium fedtschenkoi*, Morawitz, *loc. cit.* p. 122.
1911. *Anthidium fedtschenkoi*, Morawitz, Friese, *loc. cit.* p. 344 fig. 90.

Indian Distribution. Quetta.

Anthidium conciliatum, Nurse.

1903. *Anthidium conciliatum*, Nurse, Ann. & Mag. Nat. Hist. (7) xii. p. 597 (♀).

Nurse's unique type from Kashmir, 6000–8000 ft., may be an aberration of *A. manicatum*, Linn., but is not, I think, a synonym of *A. florentinum* as supposed by Friese (*teste* label). It is easily separated by the black legs.

Anthidium cingulatum, Latr.

1809. *Anthidium cingulatum*, Latreille, Ann. Mus. Hist. Nat. Paris, xiii. pp. 43, 219, pl. i. fig. 4.
1911. *Anthidium cingulatum*, Latreille, Friese, *tom. cit.* p. 365.
1879. *Anthidium imitator*, Smith, Descrip. New. Sp. Hym. Brit. Mu- p. 85 (♂).
1911. *Anthidium imitator*, Smith, Friese, *tom. cit.* p. 406.

Indian Distribution. Punjab; Gulmarg, Kashmir; Peshwar.

Anthidium anguliventre, Mor.

1888. *Anthidium anguliventre*, Morawitz, Hor. Soc. Ent. Ross. xx p. 248 (♂).
1911. *Anthidium anguliventre*, Morawitz, Friese, *tom. cit.* p. 36 fig. 102.

Indian Distribution. Quetta.

Anthidium variegatum, Fabr.

1781. *Apis variegata*, Fabricius, Spec. Ins. i. p. 483.
1911. *Anthidium variegatum*, Fabr., Friese, *tom. cit.* p. 362, fig. 11

Indian Distribution. Quetta.

Anthidium sinapinum, Ckll.

1911. *Anthidium sinapinum*, Cockerell, Ann. & Mag. Nat. Hist viii. p. 179.
1922. *Anthidium sinapinum flavatum*, Ckll. *ibid.* (9) ix. p. 660.

Indian Distribution. Quetta; Deesa; Karachi.

Anthidium sylvaticum, sp. n. (Nurse MS.).

♀. Black: head and mesonotum with fairly large round pits, the mesonotum presenting a granulated appearance; a small yellow marking on the lateral margins of the occiput behind the eyes; clypeus more or less triangular, posterior margin truncated, anterior margin rounded with a shining impunctate ridge, sides near this margin somewhat rounded, yellow, except for a gradually narrowing notch of black, as broad as the posterior margin posteriorly, which extends for about three-fourths of the length of the clypeus; space between inner orbital margins and the sides of the clypeus yellow; mandibles with five flattened teeth, the first the longest, yellow on the outside, except at apex; face with dirty white pubescence, which is most dense on the vertex; sides of mesonotum with a narrow yellow stripe; scutellum with four elongate yellow markings in a chain along the rounded posterior margin; mesonotum and underside of thorax with whitish pubescence; anterior half of each abdominal segment with conspicuous round pits, posterior half finely and closely punctured; five basal abdominal segments with transverse yellow markings, each of which originates at the lateral margins and is thickest there, then constricted and continued as a narrow club-shaped extension, the two heads of which are broadly separated on the basal segment, but approach each other more on each succeeding segment, almost meeting on the fifth; outside of tibiæ of all legs yellow; femora of first two pairs of legs with a narrow yellow line on the outer side, apex with a narrow yellow marking; tarsi of legs with bronze pubescence on under side, white on outer side; wings fusco-hyaline; tegulæ broadly ringed with yellow.

Length 11 mm.

Habitat. Simla (*C. G. Nurse*, April 1897).

This species belongs to the *manicatum* group, but is sufficiently distinct to make a comparison unnecessary.

CŒLIOXYNÆ *.

Cœlioxys hæmorrhoa, Förster.

1853. *Cœlioxys hæmorrhoa*, Forster, Verh. Nat. ver. preuss. Rheinl. x. p. 285.

1902. *Cœlioxys taurus*, Nurse, Journ. As. Soc. Beng. xx. p. 153

Indian Distribution. Quetta.

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* I have followed Dalla Torre in the spelling of this name, but it is obviously incorrect, as also would be Cœlioxinæ. Mr. J. H. Durrant suggests that it should be spelt Cœlioxysinæ, but I leave this question to hymenopterists more proficient in Greek than I am.

Cœlioxys angulata, Sm.

1870. *Cœlioxys angulata*, Smith, Trans. Ent. Soc. Lond vii p. 192 (♀).
1897. *Cœlioxys angulata*, Smith, Bingham, Faun. Brit. Ind., Hym. i. p. 511 (♀)
1903. *Cœlioxys stolidus*, Nurse, Ann. & Mag Nat Hist. (7) xi. p. 548 (♂).
1913. *Cœlioxys sulcispina*, Cameron, Ind. For. Rec. iv. p. 49.

Indian Distribution. Deesa; Jubbulpore; Dehra Dun; Punjab; Mainpuri, N.W.P.; Chapra, Bengal.

XXVI.—*New Species of* Asilidæ *from South Africa.*

By Gertrude Ricardo.

The species described in this paper are from material sent me at various times by the late L. Péringuey, Director of the South African Museum, and from specimens by various collectors handed me by Dr. Guy Marshall to determine, and, lastly, from the specimens of Asilidæ in the Brit. Mus. Coll. The types or paratypes of each new species are preserved in the Brit. Mus. Coll.

Asilinæ.

***Promachus philippinus*, Ricardo.**

Ann. & Mag. Nat. Hist (9) v. p. 228 (1920).

In the description of the legs of this species, the word "tarsi" is a misprint for *tibiæ*, the tarsi being entirely black and black-haired.

Dr. Richard Frey, in Notulæ Ent. iii. p. 28 (1923), notes males and females identified by him as this species from the Philippines.

***Promachus hirsutus*, ♂ ♀, sp. n.**

Types (male and female) and two other males, all from Saw Mills, S. Rhodesia (Rhodesia Museum).

A small black species with a white-haired abdomen, very dull red tibia, also white-haired, moustache black and white. Wings hyaline.

Length, ♂ 15–17, ♀ 18 mm.

This species appears different from most species of the genus, the large dark spots on abdomen not being present, the whole abdomen being covered with white hairs and only a median line of black spots visible.

Male.—*Face* black covered with silky-white tomentum, which becomes yellower on the lower part of face, the ground-colour of which is reddish. *Moustache* of long soft white hairs continued down the sides of the oral opening, with strong black bristles on each side of the moustache itself, upper part of face with a row of these bristles on each side and shorter white hairs on their outer border and intermingled. Beard white. Palpi with strong black bristles. *Antennæ* black, the first two joints with stout black hairs, very thick on their lower sides. Forehead the same colour as the lower part of face, with black short bristly hairs at sides, a few paler hairs visible posteriorly; hind part of head with very stout black bristles, the bristly hairs continued round head, reddish yellow. *Thorax* in type denuded, in the others black with some brownish-yellow tomentum, median and side stripes distinct, pubescence and bristles black, two præsutural bristles, two supra-alar and two postalar bristles present. *Scutellum* with black hairs and bristles. *Abdomen* black, covered with white hairs, a little longer and thicker on the first three segments, interrupted on the median line. *Genitalia* small, covered with the same white pubescence above and below. *Legs* red-brownish, upper sides of femora dull chestnut, tibiæ a shade lighter, and tarsi dull chestnut; pubescence on legs black on the black under sides of femora and on the tarsi, white on the upper sides at apices of femora, though very short and scattered, under side of femora with long black hairs; tibiæ with thick and longer white pubescence, all bristles black. *Wings* clear, the small transverse vein at the middle of the discal cell.

Female identical, but the pubescence on the abdomen not so thick; ovipositor short. *Moustache* chiefly white. A short third postalar bristle present.

Promachus cinereus ♂ ♀, sp. n.

Types (male and female) and two males from Bulawayo [Rhodesia Museum]. One pair and one female in South African [illegible]s. Coll., from Salisbury, Rhodesia.

A species nearly allied in appearance to *Promachus amastrus*, Wlk., but the genitalia in these males are quite different, nearly allied to those of *Promachus albicinctus*, Ricardo, the females may be distinguished by the distinct grey streak in the second submarginal cell and the shorter ovipositor; both sexes have the black streak on femora above not below as is usual in the Walker species.

Length, ♂ 10–11, ♀ 19 mm.

Male.—*Face* densely covered with yellowish-grey tomentum. *Moustache* of soft white hairs extending to the antennæ, on the lower part six or more stout black bristles are intermingled with the hairs *Palpi* black, with white and black hairs. Beard of soft white hairs. *Antennæ* black, the first two joints with black short bristles, the third joint barely as long as the first two joints, but the style fully equal in length to the joint itself. Forehead with brown tomentum, grey at the sides, with numerous black hairs; bristles at the back of head stout and black, round the head and on collar the hairs are white. *Thorax* blackish, covered with yellowish-grey tomentum through which the usual stripes are distinct, the side-stripes represented by two oblong spots, the median stripe divided into three narrow ones, pubescence on dorsum short and black, all bristles at sides and posteriorly are black. *Scutellum* with a double row of black bristles and some white hairs intermixed. Breast-sides black, with grey tomentum. *Abdomen* black, with whitish-grey tomentose posterior borders and sides, so that the black colour appears as large spots on each segment; pubescence on these scanty and black, on the pale parts thicker and whitish; underside with soft white hairs, thickest on the first three segments. *Genitalia* black, shining, the bifid pincers large, the upper tooth very short, the middle process long, extending beyond the pincers, which are covered at sides with bristly black hairs and a few white ones on their lower sides, these are much fewer than on the genitalia of *P. albicinctus*. *Legs* reddish yellow, with black bristles and white pubescence, longer on the underside of femora and of fore tibiæ, no bristles on underside of femora with the exception of two on the hind pair near the apex. *Wings* clear, the grey streak reaching more than halfway down the second submarginal cell, small transverse vein just below the middle of discal cell.

Female identical, but much stouter. *Ovipositor* composed of the eighth segment, black, shining, with black and white hairs. Hind femora with three black bristles below.

Philodicus cinerascens, Ricardo.

Ann. & Mag. Nat. Hist. (7) vi. p. 177 (1900), id. (9) x. p. 42 (1922) [*Alcimus*].

Philodicus umbripennis, Ricardo, id. (9) viii. p. 184 (1921).

The types of *Alcimus cinerascens* were described from Fort Johnstone, Nyasaland, those of *Philodicus umbripennis* from Nyasaland, and these all appear to belong to one species, being distinguished by the shading in apex of wing not spreading beyond the third longitudinal vein. The species is best placed in *Philodicus* genus. I have now identified specimens from Otjimbumbe, Kumene River, S.W. Africa, in S. Afr. Mus. Coll., in which the moustache is wholly white.

Philodicus nigripes, ♂ ♀, sp. n.

Paratypes (two males) from Eastern Mbale Dist., S. of Mt. Elgon, 3700–3900 ft., Uganda (*S. A. Neave*); another male from Bulawayo (Rhodesia Museum).

Type (female) from Mt. Mlanje, Nyasaland (*S. A. Neave*), and another from Hope Fountain, S. Rhodesia (Rhodesia Museum).

A species distinguished by the wholly black legs. *Moustache* black and yellow. Fore femora with some bristles below.

Length, paratypes (males), 20–22 mm.; the other male 18 mm., females 18 mm.

Male.—*Face* black with yellow tomentum. *Moustache* composed of very stout long yellow bristles below and shorter black ones above, continued up the face to the antennæ, some black bristles varying in number at sides of oral opening. *Antennæ* black, with black bristles on the first two joints, the third wanting. Forehead with black stout short bristles, also present on hind part of head. *Palpi* with yellowish hairs. Beard white. Collar with black bristles. *Thorax* brownish, with yellowish tomentose markings, median stripe divided into two narrow ones is very distinct, as are the side-stripes, composed of two large spots and a small one posteriorly; shoulders yellowish, dorsum of thorax covered with minute black bristles; the præsutural, supra-alar and postalar bristles two in number, each black and very stout. Breast-sides covered with glistening yellowish tomentum, as is the scutellum, which is armed with two black bristles and has some fine pale yellow hairs. *Abdomen* blackish, with yellowish tomentum, segmentations reddish denuded (the other male has them covered with grey tomentum); pubescence rather thick, of short yellowish hairs, yellow bristles at sides, two or three on each segment. *Genitalia* black, short with yellow hairs; underside with some soft white hairs. *Legs* black, with short yellow pubescence, the fore femora with one black bristle and soft white hairs on basal half and even one or two short yellow bristles;

the bristles on legs black and yellow. *Wings* clear, the apex with grey shading extending to the posterior border and continued in streaks in the submarginal and first and second posterior cells.

Female identical, there are fewer white bristles on the legs. Ovipositor black, shining.

Dysmachus genitalis, ♂ ♀, sp. n.

Types (male and female), and another pair from Zomba, Nyasaland (*Stannus*); one male from Hope Fountain, S. Rhodesia (*R. Stevenson*).

In Loew's Division II^{2a}, with bristles on underside of abdomen. A medium-sized species at once distinguished in the male by the very long genitalia, the last half of the long pincers being at a right angle and curved. A blackish species with yellow-grey tomentum; legs almost all black; tibiæ at base reddish; abdomen with white bristles; moustache black and white.

Length, ♂ 16, ♀ 17 mm. The male from Rhodesia measures 20 mm.

Male.—*Face* olive-green, covered with glistening ashy-grey tomentum. *Moustache* large, composed of long black and yellow bristly hairs. *Palpi* black-haired. Beard yellowish. *Antennæ* black-brown. Forehead blackish with black hairs, those on the ocelligerous tubercle long and bristly. Hind part of head with some very long black curved bristles, among which a yellow one appears, beyond these a few short black ones are present, the hairs beyond all yellow. *Thorax* brown, with yellowish-grey tomentum and a black very distinct median stripe, the side-stripes brown. Mane of thick short black hairs on whole length of thorax, longer bristly hairs project at intervals, and at sides of mane are a few short yellow hairs becoming longer posteriorly; the short pubescence on dorsum is black, the long stout bristles at sides chiefly yellow. *Scutellum* with very long numerous black bristles in a double row, and intermixed with them numerous yellowish hairs. *Abdomen* blackish, but thickly covered with yellow-grey tomentum, which leaves black triangular spots apparent on each segment, their bases resting on the posterior borders of segments; the first segment is covered with stiff yellowish hairs, these are present on the apical half of the next segment, pubescence on the dark spots black, at sides yellowish; long weak yellow bristles are present on nearly all the segments at sides on posterior borders, two in number on each side. Underside of abdomen with white hairs and short white bristles. *Genitalia* black, shining, with white pubescence on the stouter basal half of the pincers, black on the curved apical half, with a bunch of stout short black bristles on the angle, the basal half is a little longer than the curved prolongation which has a concave inner border, the under pair of pincers very short. *Legs* black, the anterior and middle tibiæ reddish on their basal half on their upper sides only, the hind pair with only traces of this colour; pubescence on legs short and white, on the fore and middle femora and tibiæ there are long weak yellow hairs; the bristles are chiefly yellow and numerous, but there are black ones on the hind tibiæ and some on all the tarsi. *Wings* clear, the small cross-vein beyond the middle of the discal cell.

Female has a more bristly appearance, with rather a stout short abdomen, the bristles on this last are more numerous, usually three instead of two on each side. *Ovipositor* black, shining, only a little longer than the last segment. *Legs* with more bristles which are almost entirely yellow.

Dysmachus stannus, ♂ ♀, sp. n.

Type (male) and others (male and female) from Zomba, Nyasaland (*Stannus*).

Type (female) in Brit. Mus. Coll.

A species in Loew's Division I. with no bristles on the abdomen, and in the group under 1^a, the mane extending the whole length of the thorax. It is nearly allied to *Dysmachus porcellus*, Speiser, but distinguished in the male by the genitalia, which are different though large and club-shaped. The scutellum is covered with numerous long but weak hardly bristly white hairs with black ones in the middle. All the tarsi are black, not reddish yellow, the tibia even the fore pair are only reddish yellow for barely two-thirds of their length.

Length, ♂ 18–21, ♀ 18–22 mm.

Male.—*Face* black, with glistening pale tomentum at sides. *Moustache* white, bordered with black bristly hairs on each side. Beard white. The curved-over bristles on hind part of head and those on forehead all white, a bunch of soft white hairs is present below the long curved bristles. *Thorax* brown, covered with yellowish-brown tomentum, leaving the broad median blackish stripe very distinct, the side-ones represented by three less distinct brown spots, the mane with soft black hairs and longer ones protruding at intervals; pubescence on dorsum black, a few longer white hairs on posterior part, all the bristles at sides black. *Abdomen* blackish with yellowish-grey tomentum at sides and on posterior borders, the rather thick pubescence is all pale in colour, underside with many pale hairs. *Genitalia* very large as in *Dysmachus robustus*, Ricardo, black with long bristly white pubescence on the lower margin of the last segment and on the lower edge of the large pincers, these last are bifid with the upper tooth very small ending in a few long white hairs, the lower one long ending in an obtuse point, largely reddish brown on the inner edge of the apical half, which is almost devoid of any pubescence, on the dorsum of the pincers it is short white. *Legs* with long white hairs on the undersides of femora, thickest on the two anterior pairs, the hind pair with many stout black bristles below, tibiæ with the same long weak white hairs, on their edges with long black bristles, the anterior pair with three or more extra long but weak black bristles, all the bristles on legs are black. *Wings* clear, tinged brown.

Female identical. *Ovipositor* short, black, with some short yellowish pubescence at apex.

Cinadus africanus, ♂ ♀, sp. n.

The species now described under this genus, which so far has been restricted to the Oriental and Australian Regions, agrees in all the generic characteristics described by v. d. Wulp, with the exception of the genitalia in the male, which are smaller and simpler, and the abdomen is not quite devoid of bristles, but, as v. d Wulp emphasizes the abrupt bend of the posterior branch of the third vein as one of the chief features of the genus, it seems best to place this species here for the present.

Types (male and female) and other females from Zomba, Nyasaland (*Stannus*).

A medium-sized blackish species with pale bands on the abdomen and reddish legs. Wings shaded at apex and on posterior border.

Length, ♂ 17, ♀ 17–20 mm.

Male.—*Face* narrow, broader below and produced, blackish covered with brown and grey tomentum. *Moustache* scanty, composed of long stout whitish bristles with one or more equally stout black bristles above intermingled with fine black hairs, round the sides of the oral opening are black bristles and fine black hairs. *Palpi* black-haired. *Antennæ* with the first two joints reddish yellow with black hairs and bristles, the third joint destroyed, but in a very closely allied species in the Brit. Mus. Coll. from Nyasaland it is blackish, with the long fine bristle of the genus. Forehead small, with some short black bristles and hairs. Hind part of head with very stout black bristles. Beard white. *Thorax* brownish with yellowish-grey tomentum, a median divided stripe and indistinct side-stripes are present, dorsum of thorax with very minute numerous black bristles. A few scattered white hairs are apparent, bristles at sides very large and black, those on posterior border are intermingled with fine black hairs. *Scutellum* with two black bristles. *Abdomen* brownish black, with grey tomentum on dorsum and at sides, also disposed as bands on the posterior borders of segments on which are distinct black and yellow bristles, the pale ones chiefly at the sides, the first segment with three very stout ones at sides and fine white hairs, dorsum of abdomen covered with the same minute bristles as on thorax. *Genitalia* black, consisting of a long pair of upper pincers ending in a point, but stout for most of their length, the under pair short, the middle pieces long, reddish, the pubescence black, white at apex. *Legs* reddish yellow, with black bristles on the under side of femora, about three in number, the hind femora black on their upper sides, pubescence chiefly black, but white on the fore and middle tibiæ on which also white bristles appear, elsewhere they are black. *Wings* clear, shaded faintly at apex as far as the base of the fork of the third vein and narrowly along the posterior border to the anal cell, small transverse vein beyond the middle of the discal cell.

Female identical. *Ovipositor* short, with black pubescence.

Cinadus occidentalis, ♂ ♀, sp. n.

Paratypes, 2 ♂, from Sankwarra and Yapi, N. Territories, Gold Coast (*Dr. J. J. Simpson*).

Type (female) from Illorin, Prov. Northern Territories (*Dr. J. W. Scott Mackie*), all in Brit. Mus. Coll.

A species very nearly allied to *Cinadus africanus*, sp. n., but the genitalia of the male are different, the palpi in both sexes are white-haired.

Length, ♂ ♀, 18 mm.

Face broader with a larger tubercle and much lighter in colour with yellowish-white tomentum, the bristles round the sides of the oral opening are whitish. *Antennæ* reddish yellow, the third joint blackish with long fine bristle. *Abdomen* brownish black with grey tomentose segmentations, and reddish-brown tomentum with fine short yellow pubescence, so that it appears less black than *C. africanus*; no bristles are present on the dorsum, those at sides are white and long, the first segment with two yellow bristles and soft pale hairs. *Genitalia* typical of the genus, being large, the upper forceps bluish black, shining, with yellow pubescence, large and bifid, much stouter and wider at base than in *C. africanus*, the under pair of pincers reddish brown at their apices and with yellowish hairs. *Legs* reddish yellow, the femora in the male with no bristles below and only some long weak ones in the female, three rather long black ones are distinct on the hind femora, the fore tibiæ with two long yellow bristles and two similar ones on the first joint of the tarsi, bristles elsewhere on the legs black; a yellow one occurs occasionally. *Wings* with the posterior branch of third vein not quite so abruptly bent as in *C. africanus*.

DASYPOGONINÆ.

The divisions or subgroups suggested by the late Prof. Hermann and published by Dr. Speiser in Zool. Jahrb. xliii. 1920, are here adopted as follows:—

Abdomen with only six segments in the male.... ...... *Pyrtaninæ*.
Abdomen with seven or eight segments in the male.
Acanthocneminæ for species with a curved spine at apex of fore tibiæ.
Eremocneminæ for species with no such curved spine at apex of fore tibiæ.

PYRTANINÆ.

Anypodetus maculipennis, ♂ ♀, sp. n.

This species is placed in this genus with some doubt, as it does not altogether agree with Hermann's last description of the genus published in Zool. Jahrb. xliii. pp. 168, 173 (1920) by Dr. Speiser. The veins closing the discal and fourth posterior cell are not in the same line, but almost run in the same direction. The spines on the third joint of the antennæ are placed at the blunt apex of the two-jointed style and are two in number, and the numbers of the thoracic and abdominal bristles are not quite the same. In most respects, such as want of pulvilli and general characteristics, it appears a true *Anypodetus* species.

Type (male) from Saw Mills, S. Rhodesia. Type (female) from Bulawayo, and other males and females from the same locality (Rhodesia Museum).

A broad-bodied species with brown mottled wings and a testaceous abdomen. Legs pale reddish yellow, the femora darker.

Length, ♂ 7–10, ♀ 10–11 mm.

Male.—*Face* broad, slightly convex, black, shining, covered with short black hairs, a band of yellow-brown tomentum about midway divides these from the thicker short black hairs round the oral opening, with black bristles intermixed. Forehead very broad and reaching behind the eyes, covered with yellow-brown tomentum, ocelligerous tubercle with two rusty-red bristles, numerous bristles of the same colour at the sides and posteriorly, intermixed with some fine yellowish hairs which also border the hind part of head. *Antennæ* reddish yellow the third joint dusky except at its base, the first two joints equal in length with long rusty-red bristles on their under sides, the third joint longer than the first two together, bare, the style stout with two stout short spines. Collar covered with paler tomentum than the forehead, with a fringe of rusty-red bristles and hairs. *Thorax* testaceous, but covered with yellow-brown tomentum and with very short yellow appressed pubescence, anteriorly three distinct short stripes of ashy-grey tomentum are visible, the same-coloured tomentum spreading to the shoulders; in the centre of the dorsum are black median and side stripes, indistinct, but reaching to the scutellum, the pubescence on these is dark; breast-sides the same colour as thorax. One presutural, three or four supra-alar, and two post-alar bristles, chiefly rusty red, are present. *Scutellum* same colour as thorax, wholly devoid of bristles. *Abdomen* bright testaceous in colour, bare, with short pale yellowish pubescence on sides, the bristles on the sides consist of four rusty-red ones on the first segment and a single stout black one on the others; dorsum of abdomen somewhat punctuated. *Genitalia* very small, concealed under the last segment, reddish yellow, flanked by long black hairs on each side. *Legs* reddish yellow with black bristles, which are long and numerous on the tarsi; pubescence short black on under side of fore tibiæ; fore and middle femora chiefly black, almost bare, the hind femora less dark with some short yellow and black pubescence; short black bristles below and above, the middle and hind tibiæ with short yellow and white pubescence, the hind pair with a brush of black hairs below at apices, also present on underside of each of the hind tarsi. *Wings* brownish yellow, having two deep brown bands, most intensive on the anterior border, but reaching to the middle of the wing, apex clear, there are also clear spots in the posterior and anal cells and a large one in the axillary lobe; veins a deep black, some very thick, the marginal cell closed and stalked, the first posterior cell open but in some specimens quite narrow, not closed however in any, the vein closing the fourth posterior cell is about a fifth of the length of the discal cell, below the discal closing vein.

Female is identical.

Anypodetus nigrifacies, ♂ ♀, sp. n.

Types (male and female) and another male and female, all from Lorenzo Marques, Portuguese E. Africa (*F. D. McMillan*), in Brit. Mus. Coll.

A robust species with a blackish or reddish-brown abdomen marked with grey tomentum at sides; *thorax* reddish brown. *Legs* dark. *Antennæ* reddish yellow. *Face* with black bristles and hairs.

Length 10–12 mm.

Male.—*Face* dull black, with a little very short appressed pubescence, reddish yellow in colour. *Moustache* consists of black bristly or finer hairs thickest in the middle of the face and reaching to the antennæ, stouter black bristles surround the oral opening. Forehead densely covered with brown tomentum, lighter at sides and extending to the face; two or three short black fine bristles on the anterior corners, and two longer more robust ones on the ocelligerous tubercle. Hind part of head with reddish-yellow bristles. *Antennæ* bright reddish yellow, the first joint with two strong black bristles on its under side, the second joint almost bare, the third joint and style as in *Anypodetus fasciatus*. Collar and prothorax with some soft reddish-yellow hairs. *Thorax* lighter in colour than the abdomen, reddish brown, with grey tomentum and pitted with very minute yellow and black hairs. Median stripe indistinct, shoulders with two small black bristles; two præsutural and supra-alar and one postalar, all black, are present. *Scutellum* bare, same colour as thorax. *Abdomen* more dark reddish brown than black, with greyish-white-haired side-spots on each segment, the first one with a row of four black bristles at side, two on sides of second and third, and one on the others. *Legs* uniformly dark reddish brown with black bristles, pubescence almost nil, but when present black. *Wings* hyaline, tinged grey, the veins on the fore border yellowish, the veins closing the discal and fourth posterior cells running in the same line, the small transverse vein below the middle of the discal cell.

Female identical. *Wings* rather darker in colour; the second præsutural and supra-alar bristles reddish yellow and much weaker.

Perasis transvalensis, ♂ ♀, sp. n.

Types (male and female) from Delarey, W. Transvaal (*Dr. Braun*), and another from same locality in South African Mus. Coll.

Hermann described the typical species of the genus as *P. sareptana*, from S. Russia; he mentions *P. meridionalis* as from the Transvaal in Zool. Jahrb. xliii. 1920, p. 177, but no description appears to have been published of it.

A black species with dark wings. Face with short glistening white hairs forming the moustache (♂), yellowish in ♀, with black bristles in male and yellow ones in female round the oral opening.

Length 11–12 mm.

Male.—Face black, covered with a dense snowy-white *moustache*, the soft hairs recumbent, reaching the numerous long black bristles round the oral opening. *Antennæ* with numerous stout black bristles on the first joint, the second comparatively bare. Forehead, hind part of head, and collar all armed with stout black bristles. *Thorax* bare on dorsum, at sides the black bristles are very long and stout, sides of thorax with some white silvery tomentum, and the posterior border of thorax is ashy grey. *Abdomen* black with silvery-white bands on sides not extending to dorsum, but both males are in poor condition, denuded. *Genitalia* black and reddish brown with some bright orange-yellow hairs. *Legs* with black bristles and black pubescence, some lighter hairs on the tarsi. *Wings* tinged brown with dark veins, the first and fourth posterior cells closed and stalked.

Female.—Wings paler with a yellow tinge and veins yellow on fore border. *Moustache* glistening yellow, the bristles also reddish yellow. Beard yellow. Coxæ with pale tomentum.

ACANTHOCNEMINÆ.

Neolaparus angusticornis, ♀, Hermann, *in litt.*, sp. n.

Type (female) labelled as above by the late Prof. Hermann and returned in the Imp. Bur. Ent. Coll., now presented to the Brit. Mus. Coll., is from Chilanga, N.W. Rhodesia (*R. C. Wood*, on grass).

Type (male) from Mlanje, Nyasaland (*J. B. Davey*), and another male from Saw Mills, S. Rhodesia (Rhodesia Museum).

A species in Loew's Division I. at once distinguished by the narrow long third joint of antennæ. Abdomen blackish with some reddish-brown spots and grey tomentose segmentations. Legs uniformly yellow. Wings hyaline.

Length, ♂ 14–15, ♀ 14 mm.

Male.—*Face* pale yellow covered with glistening paler tomentum. *Moustache* composed of two pale yellow bristles, no hairs intermixed or on face. Palpi black-haired. *Antennæ* reddish yellow, the two first joints paler with short black bristles, the third reddish, cylindrical, with a very small style, the joint as long as the first two together, devoid of pubescence, one or two very minute black bristles only are discernible. Forehead with yellowish-brown tomentum, bare. The two bristles at back of head are yellow. *Thorax* olive-green, at sides and on anterior border with glistening pale yellowish tomentum; pubescence consists of very minute black bristles, the strong bristles at sides yellow. *Scutellum* with tomentum as at sides of thorax. *Abdomen* reddish brown with black median ill-defined spots and the posterior borders are black covered with whitish tomentum, which also appears on the fore borders of the first four segments. *Genitalia* large, shining, bright reddish brown with rather long black pubescence, on the dorsum the short black pubescence is very apparent, viewed sideways. *Legs* yellow with black short, not very thick, pubescence, and with pale bristles. *Wings* hyaline, *very* faintly shaded at apex and on posterior border, the fourth posterior cell narrower at border.

Female identical. A brown median stripe is distinct on the *thorax*, probably because it is less denuded than the male. Abdomen in one female is almost wholly black, the reddish-brown colour confined to the base and the last segment. *Ovipositor* with reddish spines.

Neolaparus anaxilas, Wlk., is correctly placed in this genus in Kertesz's Cat.; the type is destroyed.

Neolaparus letifer, Wlk., also belongs to this genus, as do *Neolaparus tapulus* and *videns*, Wlk., all originally described under *Dasypogon*.

The same is the case with *Neolaparus alcippe*, Wlk., which is apparently a synonym of *Neolaparus aulicus*, Wied.

Pegesimallus clælius, Walker.

List Dipt. Brit. Mus. ii. p. 351 [*Dasypogon*] (1849).
Pegesimallus ursinus, Loew, Dipt. Fauna Südafrik. i. p. 69 (1860).

Comparing the type of *D. clælius* with Loew's description, I have no doubt it is identical with his species, for which he created the genus *Pegesimallus*.

EREMOCNEMINÆ.

Sisyrnodytes niveipilosus, ♀, sp. n.

Paratypes (five females) from Bulawayo (Rhodesia Museum).

A densely pale pilose species with reddish-brown legs. Moustache and tufts on anterior border of thorax snowy-white. Wings hyaline, veins at base and on fore border reddish yellow, elsewhere brown.

Length 9–10½ mm.

Face black with snowy-white tomentum and hairs at sides. *Moustache* and beard silvery white. *Antennæ* brown, the apex of style pale. Forehead black with tufts of reddish hairs anteriorly at sides, the hairs on ocelligerous tubercle and on posterior border snowy white. Hind part of head with reddish-yellow bristles. *Thorax* blackish brown, densely covered with long reddish-yellow and white hairs, the fore part with tufts of snowy-white hairs, which also extend as indistinct short median and side stripes, the hairs posteriorly in the centre are brown. *Scutellum* with pale reddish-yellow hairs. *Abdomen* blackish brown covered with pubescence, the fore borders of segments with reddish recumbent hairs in some of the specimens, otherwise the pubescence consists of long dirty yellow-coloured hairs; at sides and apex of longer soft pale hairs, very dense and long at apex, so that it is difficult to determine the sex; underside with long pale hairs. *Legs* reddish yellow, all the femora shining blackish brown, except at apex, clothed with long reddish and pale yellow hairs, tibiæ with shorter white hairs, all bristles whitish, very numerous on the hind tibiæ and tarsi.

Damalis femoralis, ♂ ♀, sp. n.

Types (male and female) and others from Willow Grange, Natal (*R. C. Wroughton*).

A blackish-brown species, covered with grey tomentum. Moustache black, the hairs not curled upwards. Legs black and yellow, the hind femora slender comparatively, but yet incrassate, with strong black bristles below. Wings pale brown.

Length, ♂ 9–10, ♀ 10–12 mm.

Male.—*Face* black, shining on lower part, with ashy-grey tomentum below the antennæ and at sides. *Moustache* of numerous black, long, rather weak hairs, all straight or inclining downwards; a few whitish hairs are visible below. Beard scanty, white. *Palpi* with black bristles. *Antennæ* black, with the usual long bristle on third joint, the first two joints with black bristles. Forehead with black hairs. Hind part of head with white hairs. *Thorax* blackish brown with yellowish-brown tomentum on dorsum and at sides, stripes indistinct, but present, pubescence on dorsum rather thick, consisting of a row of long black hairs each side of the median line and shorter hairs elsewhere; on the posterior part of thorax some long whitish hairs appear. *Scutellum* on the posterior border fringed with black hairs, eight or more in number. Breast-sides covered with yellowish-brown tomentum and weak white hairs. *Abdomen* blackish, thickly covered with ashy-grey tomentum, leaving the posterior borders of segments narrowly black, shining: pubescence short, whitish, thickest at sides, the last segment on its posterior border armed with some stout black bristles. *Genitalia* black, almost devoid of pubescence, the pincers large; under side with weak whitish pubescence. *Legs* long and slender, the femora black, the posterior pair obscurely reddish at the extreme base; the tibiæ reddish yellow, black at apices, but the hind pair almost wholly reddish yellow; tarsi blackish, the first joint chiefly reddish; pubescence on legs not very thick, white on the femora, longer on the under sides, the hind femora with six stout, short, black bristles and one or two very small ones in between, on the underside near the apices; fore tibiæ swollen at apices, with black pubescence and long black hairs on the whole length of the under sides, middle pair with the same, not swollen at apices but with an oblong projection from apices, the hind pair much more bare with chiefly pale hairs; tarsi with many black hairs and bristles. *Wings* pale brown, rather reddish yellow on the fore border, the small transverse vein beyond the middle of the discal cell, nearer its apex.

Female identical, but the *legs* are more widely reddish yellow, only the extreme apices of femora and the joints of the tarsi being black; the femora are shining, with very little pubescence.

This species is allied to *Damalis longipennis* and *annulata*, Loew.

Damalis pollinosa, ♀, Hermann, *in litt*, sp. n.

Type (female) labelled by Hermann as above from Mt. Mlanje, Nyasaland (*S. A. Neave*), and three other females, all in Brit. Mus. Coll.; and two females from the same locality (*J. B. Davey*), Imp. Bur. Ent. Coll.

One female from Entebbe, Uganda (*C. C. Gowdey*), in Brit. Mus. Coll.

One female from Nairobi (*Dr. V. G. L. v. Someren*).

A species allied to *Damalis hyalipennis*, having clear wings. A mahogany-brown species with some grey tomentum. Legs mahogany-brown. Antennæ and moustache black.

Length 11–12 mm.

Face shining red on its lower half. *Moustache* composed of four black bristles at oral opening; above and around the large transverse red spot the face is covered with greyish-brown tomentum. *Antennæ* black, the apical half of the hair-like bristle paler. *Palpi* with black hairs. Ocelligerous tubercle large, dark brown, shining. *Thorax* mahogany-brown, with dark brown indistinct median and side-stripes; dorsum bare, with some lighter tomentum at sides and posteriorly and some yellow hairs on posterior part of thorax, the bristles at sides very short and weak, pale yellow chiefly. *Scutellum* similar, base with weak yellow bristles on its posterior border. *Abdomen* mahogany-brown, with some grey tomentum, chiefly at sides, and with short, not very discernible, pale yellow or white pubescence, thicker on the last two segments. *Legs* the same colour as abdomen, in some of the specimens rather lighter, and sometimes with indistinct black markings on the hind femora, which have only four or more short black bristles close to their apices; pubescence of legs whitish and black but scanty, the hind femora with longer pale yellow hairs below on their basal halves, bristles fine, black. *Wings* hyaline, the small transverse vein beyond the middle of discal cell.

Damalis imbutus, Wlk., is a synonym of *Damalis hirtiventris*, Macq., as remarked by Loew in Dipt. Süd-Afrik. p. 97.

MICROSTYLUM, Macq.

Species with the first posterior cell closed or very narrow.

Microstylum hermanni, ♂ ♀, Hermann, *in litt.*, sp. n.

Types (male and female), caught *in copula*, from Willowmore, Cape Colony (*Dr. Braun*), and another male from same locality. A female from Kimberley and a female from

Cape Colony; this last was labelled *M. brunnipenne* by Hermann in South African Mus. Coll., but, as this name has already been used for a species from the Oriental Region, I have named it after the late Professor.

A species with the first posterior cell closed or nearly so, the males with dark brown wings, clear in the females. In colour blackish, covered with thick short white pubescence. Legs reddish, the under sides of femora black, all covered with pale hairs and bristles.

Length, ♂ 24, ♀ 20–24 mm.

Male.—*Face* black, covered with grey tomentum; the large tubercle carries a very large bushy *moustache* composed of dirty yellowish weak bristles intermingled with the same-coloured hairs. Beard and hairs on palpi the same colour Proboscis at apex with a tuft of small hairs. *Antennæ* pale reddish, the first two joints blackish with white hairs, the third club-shaped, small, with the stalk of club rather long. Forehead with brighter tomentum, on each side with stout yellow and darker weak bristles; ocelligerous tubercle with six or more stouter brown bristles. Back of head with a thick fringe of pale yellow hairs *Thorax* dark brown, the shoulders reddish, tomentum yellowish brown, through which a median and side stripes appear, the median divided by a grey tomentose line; dorsum of thorax very bristly, with some black bristles on each side of the median stripe and weak yellow bristly hairs between and on the centre line; on the posterior half the bristles are yellow and very long. Præsutural bristles 4, supra-alar 3, post-alar 5. *Scutellum* with a row of stout yellow bristles on the posterior border, and on its dorsum some weak yellow hairs. *Abdomen* blackish, with short white, almost bristly hairs. *Genitalia* black, the insides of upper pincers reddish yellow; pubescence whitish with longer bristly hairs on apices of pincers. *Legs* reddish yellow, covered with white pubescence and many very stout long yellow bristles; underside of all femora black, with short and long white hairs, the outer sides of tibiæ darker. *Wings* dark rich brown with pale spots in most of the cells.

Female is similar, but the *wings* are quite clear. The large bristles on the thorax are chiefly black.

The first posterior cell in this species varies, being either closed with a short stalk, closed at border, or very narrowly open.

The only two species as yet described with the first posterior cell closed are *M. simplissimum*, Loew, from one male found in Natal, and *M. cilipes*, Macq., a species from

Madagascar with fringed tibiæ. Loew's species has paler wings and is described as dark ashy grey becoming yellowish, and the tarsi of the legs dark. The veins near post-border very much finer than the others.

Species with the first posterior cell open

Microstylum lituratum, Loew.

Wien. Ent. Monatschr. vii. p 10 (1863).
[*Microstylum elegans*, Ricardo, Ann. & Mag Nat Hist. (7) vi. p 16 (1900)]

A specimen in the South African Mus. Coll. thus labelled by the late Prof. Hermann drew my attention to the species originally described by Loew from Bloemfontein (the male sex only), and I have no doubt Hermann's synonymy is correct.

***Microstylum capense*, ♀, Fabr.**

Syst. Antl. clix. p. 4 [*Asilus*] (1805).
[*Microstylum serranus*, ♂, Wlk. List Dipt. Brit. Mus ii. p. 308 (1849) [*Dasypogon*].]

A male specimen sent me from the South African Mus. Coll., identified presumably by the late Professor Hermann as *M. capense*, Fabr., is identical with the females of this species, and thus proves that the supposition, both by Schiner and Loew, that *M. lacteipenne*, Wied., is the male of this Fabrician species is incorrect, and the female of the Wiedemann species is still to be found. Walker's male type is identical with the *M. capense* male.

The species is black with a bright yellow beard, the hairs on collar and behind the head the same colour. The male has the legs rather darker, and the white spots at the sides are present on all the segments except the last one.

***Microstylum fenestratum*, ♀, Wied.**

Auss. zweifl. Ins. i. p. 377 [*Dasypogon*] (1828).

Described from an unknown locality originally.

A male and three females in South African Museum Coll. are labelled by Hermann as this species from localities in Cape Colony.

In Brit. Mus. Coll. a male from Willowmore, Cape Town (*Dr. Braun*).

Microstylum spurinus, Walker.

List Dipt ii p. 323 (1849).

Types (male and female) from interior of S. Africa (presented by Earl Derby).

Both types are in bad condition.

A slender species; the *male* has an ashy-grey *abdomen* with narrow fulvous segmentations and narrow grey stripes on sides. Genitalia red with white hairs. *Female* has the last four segments reddish yellow, shining. In both sexes the *moustache* is composed of yellowish-white bristles and hairs. *Antennæ* with the first two joints blackish, the third wanting. *Thorax* and *scutellum* with white bristles. *Legs* bright reddish yellow, a black stripe on the femora; apparently most of the bristles are white, tibiæ at apices and the tarsi darker in colour. *Wings* in female clear, in male destroyed, but Walker describes them as identical in both sexes.

Length 23–21 mm.

Microstylum helenæ, Bezzi.

Ann. Mus. Zool. R. Univers. Napoli, (2) iv. r. 14, 1914, p 3.

Males and females in great numbers from Mt. Mlanje. Nyasaland (*S. A. Neave*).

This fine species has been only known in the female sex as yet; the many males taken with the females in Nyasaland are very similar in shape but much darker in colour.

Antennæ and hairs on forehead black. *Thorax* black, covered with grey tomentum, ashy grey at sides, all bristles black on thorax and scutellum. *Abdomen* velvety black with black pubescence, the last four segments with ashy-grey bands on their posterior borders. *Genitalia* stout, black with black and white hairs. *Legs* entirely black with black hairs and bristles. *Wings* darker, deep smoky grey.

Length 14–18 mm.

The grey bands on abdomen in some specimens are three in number only. A specimen (female) in Brit. Mus. Coll. has only one entire white band, not two, but in other respects is similar; this is probably only a variation, though in the long series of females from Mt. Mlanje there is not one like this which comes from between Mombasa and Lake Victoria (*F. J. Scott Elliot*). A male from Mamboya, German E. Africa, also in Brit. Mus. Coll., has five ashy-grey bands on abdomen and some white hairs; the legs also, though black, have thick white pubescence on the tibiæ and metatarsi, and a few white bristles. Nearly every individual in the series of specimens has been captured with prey, consisting of other Asilidæ, such as *Promachus* species, other Diptera, beetles, etc.

Microstylum partitum, ♀, Walker.

Ins. Saund i p. 156 (1851).

Type (female) from Natal.

Female.—*Face* covered with glistening yellow tomentum. *Moustache* composed of pale yellow bristles above the oral opening. *Antennæ* blackish, the first two joints with some yellow hairs, the third is largely reddish, only dark at base. Forehead as face, with long yellow bristles on each side. Beard white. *Palpi* white-haired. Hind part of head with whitish bristles. *Thorax* brown with paler tomentum and a distinct median stripe, divided in the middle; all bristles at sides and on dorsum are white. *Scutellum* greyish, with two white bristles. *Abdomen* blackish, covered with grey tomentum, the last two segments shining, dark reddish brown. *Legs* brown, the fore and middle femora reddish with black stripes, the hind pair black at apex; tibiæ reddish brown, the tarsi the same; all bristles on legs are white, the pubescence (not very noticeable) is short and yellow. *Wings* clear, tinged yellow, veins reddish yellow.

Two females sent me by Mr. Péringuey from S.W. Africa and a male may be specimens of this species; this latter has all the bristles white and the abdomen more red than black, but the females have black bristles on the tarsi and those on the tibiæ are chiefly black, only a few white ones apparent at the sides.

Microstylum pica, ♂, Macq.

Dipt. Suppl. i. p. 59, pl. vi. fig. 6 (1846).
[*Microstylum aterrimum*, ♂ ♀, Loew.]

Both species are described as from Kaffraria; Loew's species seems identical with the male described by Macquart.

Microstylum hildenbrandti, ♂, Karsch.

Ent. Nachricht. xi. p. 345 (1885).

Two males from Ambohimitombo Forest, Madagascar (*Forsyth Major*), two females from Madagascar (*Rev. W. D. Cowan*), and another female are presumably females of this species.

Abdomen differs from male in being wholly black, shining. Beard and face black.

Length, ♂ 22, ♀ 38 mm.

Karsch does not give the sex of his *M. rabodæ* and *M. radamæ*; it appears possible that *these* females are identical with the latter; the spur of middle tibiæ being simple club-like as in *M. radamæ*, this latter would then be the female of *M. hildenbrandti*.

Microstylum rufum, ♂ ♀, sp. n.

Types (male and female) and a series of both sexes from Mt. Mlanje, Nyasaland (*S. A. Neave*).

A short stout species, bright chestnut-coloured with reddish legs. Genitalia large with yellow hairs.

Length, ♂ 18–20, ♀ 22 mm.

Male.—*Face* covered with glistening white tomentum. *Moustache*, confined to border of oral opening, is composed of long white hairs and strong yellow bristles. *Palpi* black with yellow bristles and some black ones at the sides, occasionally they are all black. *Antennæ* bright red, the first two joints with yellow bristly hairs, the second joint longer than the first, the third joint about as long as the two together, only slightly narrower at base. Forehead with a few long yellow bristly hairs at sides and on vertex. Hind part of head with yellow bristles. Beard white. Collar with yellow hairs and one long black bristle on each side. *Thorax* reddish but covered by the black-blue stripes and with grey tomentum at the sides, the black median stripe divided in the middle, not reaching the posterior border, the side-stripes represented by a large spot, shoulders reddish with four or more stout black bristles; pubescence on dorsum short, black, with longer yellow hairs on posterior part, all bristles black, stout, and long; sides with grey tomentum and one black bristle below the wings. *Scutellum* with four or more strong black bristles on its posterior border; anteriorly it is the same colour as the thorax, posteriorly chestnut-coloured. *Abdomen* shining, a little darker at the extreme apex, pubescence unnoticeable, short, black, the first two segments with a bunch of short black bristles on each side, sides of abdomen with traces of white tomentum. *Genitalia* reddish with yellow hairs, pincers large, ending in fine points; under side of abdomen darker. *Legs* the same colour as abdomen, fore femora at their base and all tarsi except the fore pair black, bristles all black. *Wings* tinged brown, veins yellowish.

Female identical. *Abdomen* with the black colour at apex chiefly on the last two segments as large dark side-spots, as is often the case in the male. *Palpi* chiefly black-haired.

This species is allied to *Microstylum acutirostre*, Loew, in size and general appearance, but is distinguished by the wholly white moustache and by the brighter colour of the legs, the femora red not dark.

Microstylum spinipes, ♂ ♀, sp. n.

Types (male and female) and others from Mt. Mlanje, Nyasaland (*S. A. Neave*), others from Bua River and Lingadzi, near Domera Bay, and Fort Johnston, all localities in Nyasaland, but the male type comes from E. of Mt. Mlanje, Portuguese E. Africa.

A species distinguished in both sexes by the very small spines on underside of femora, on shoulders and on dorsum of thorax, otherwise the sexes are very dissimilar in colouring and in the wings which are hyaline, tinged yellowish brown in the female, but a dark rich brown in the male, which is much more slender in shape.

Length, ♂ 28–32, ♀ 24–32 mm.

Male —*Face* covered with glistening yellowish-white tomentum. *Moustache*, confined to the borders of the oral opening, is composed of a few yellow bristles with some white hairs intermixed. Palpi with stout black bristles. Beard white. *Antennæ* blackish, the third joint dull reddish, black at base, the first two joints with black bristly hairs, the third long. Forehead darker than the face, with black and yellowish bristles on each side and on vertex, the bristles on hind part of head are yellow. *Thorax* chestnut-brown, no stripes visible, but in most of the specimens they are present, the thorax is often darker, grey tomentum is traceable on the dorsum, all the bristles are black, stout but short, the small spines cover the dorsum of thorax and its sides, and a few are visible on the breast-sides, which are reddish with yellowish tomentum. *Scutellum* the same as the thorax, also with the small spines and two or more stout black bristles on its posterior border. *Abdomen* black, shining, with traces of fulvous or yellowish segmentations, and with fine whitish pubescence, sides covered with grey tomentum. *Genitalia* small, black, the upper piece and forceps reddish, with whitish hairs at apices, or blackish altogether and with black hairs. *Legs* almost entirely reddish, the tarsi black, the bristles and spines black, some white bristles on the hind tibiæ and single ones at apices of the other tibiæ, pubescence very slight where present, white and short, some of the males have the legs entirely black with the white bristles as in the others, and the third joint of the antennæ is dusky in these. *Wings* dark brown, slightly paler on the posterior border and at apex.

Female.—*Face* and forehead covered with glistening yellow tomentum. *Moustache* composed of strong yellow bristles above the oral opening. Palpi black, with stout black bristles. *Antennæ* reddish brown, the first two joints equal in length with a few short black bristles below, third longer than the two together, almost the same width throughout. Forehead with yellow bristly hairs on each side. Hind part of head with black and yellow bristles. Beard white. Collar with a few yellow hairs. *Thorax* reddish brown, obscured by greyish tomentum, with a median blackish-brown stripe divided by a line of white tomentum, shoulders covered with white tomentum, red underneath and with very small black bristles or spines, also present on dorsum of thorax; sides of thorax and breast covered with greyish or yellowish tomentum. *Scutellum* reddish or black, covered with grey tomentum and with small spines, two large black bristles on border. *Abdomen* bright, shining, chestnut-brown, a little dusky at apex, bare of pubescence, short yellow hairs at sides. *Legs* red, tarsi a little darker, all bristles black, pubescence chiefly white, short, bristles on legs numerous. *Wings* large, the basal cells a little paler.

Microstylum unicolor, ♂ ♀, sp. n.

Type (male) and a female from Babapupa to Ladabu, N. Nigeria (*Dr. J. W. Scott Macfie*). Type (female) and another from River Oshin, 5 m. N. of Okemi, N. Nigeria (*Jas. J. Simpson*). Another female from Okemi-Lonwa (*Dr. J. W. Scott Macfie*). Another male from Lagos, S. Nigeria (*J. R. de Odys*). All presented by Imp. Bur. Ent. to B.M. Coll.

A reddish-yellow slender species allied to *M. dispar*, Loew, in appearance, but easily distinguished by the yellow moustache in both sexes and the yellowish-red legs.

Length, ♂ 23–25, ♀ 23–25 mm.

Male.—Neither of the males is in very good preservation. *Face* yellowish brown, glistening, with some grey tomentum, composed of six or more pale yellow bristles and a few yellow hairs interspersed. Beard scanty, pale yellow, hairs on the palpi the same colour. *Antennæ* reddish, the third joint with some grey tomentum, the hairs on the first two joints yellow. Forehead same colour as the face, with lighter yellow bristly hairs at sides and on back of head. *Thorax* brown, with some grey tomentum, scattered minute black bristles, and apparently devoid of pubescence, the median divided line quite distinct. Bristles at sides pale yellow, some missing, but there are three præsutural and a few long ones on posterior part of dorsum. *Scutellum* same colour as thorax, with probably two yellow bristles. *Abdomen* long, slender, reddish yellow, the last two segments black at the sides. *Genitalia* reddish, prominent, the upper pincers shorter and a little darker than the lower ones, all with fine yellow hairs, also present on the drawn-out apex of the median process. Abdomen devoid of pubescence, some fine short yellow appressed bristles on the last two segments. *Legs* with faint black markings on the apical third of the femora, almost on the whole length of the middle pair; tarsi more reddish brown; bristles all yellow, very short, except on the tarsi, apices of tibiæ, and on the hind legs; pubescence short, white. *Wings* brown, somewhat lighter on the anterior border.

Female identical. *Abdomen* on the sides of all the segments black, forming a stripe, largely covered with grey tomentum. Bristles on the legs more numerous, many on the tarsi reddish brown and a few on the fore tibiæ black. *Wings* a paler brown.

Two females from N.W. Rhodesia appear identical with the above, but the wings are still paler, almost clear.

Microstylum attenuatum, ♂ ♀, sp. n.

Type (male). Type (female) taken *in coitu* Mt. Mlanje, Nyasaland (*S. A. Neave*), and a series of males and females.

A slender blackish species, the males with black legs, the females with partly red legs. Abdomen in male black, in the female appearing grey, by reason of the tomentum.

Length, ♂ 23–25, ♀ 23–27 mm.

Male.—*Face* olive-brown with yellowish-grey tomentum. *Moustache* thin, composed of a few not very stout yellow bristles and white hairs. Palpi with black bristles. Beard white. *Antennæ* blackish, the first two joints with black hairs, the third long. Forehead with chiefly black bristly hairs. Bristles at back of head black. *Thorax* blackish brown, covered with grey tomentum, the stripes very distinct, pubescence short, black, and almost bristly, all bristles black. Breast-sides covered with ashy-grey tomentum. *Scutellum* covered with ashy-grey tomentum, and with two or more stout black bristles on border. *Abdomen* blackish, with grey tomentum forming a stripe at sides, and on dorsum is some dull-coloured tomentum, appearing greyish near the posterior borders, segmentations dull fulvous, pubescence nearly absent, short and pale at sides. *Genitalia* black with white hairs at apex. *Legs* black, dull reddish at extreme base of femora, coxæ densely covered with grey tomentum and hairs, bristles chiefly black, but white ones are present on the hind tibiæ and often on the others on the outer side, and on the tarsi; pubescence not very noticeable, chiefly white and short, even below the fore femora. *Wings* clear, hardly tinged at all in any of the specimens.

Female.—Face with glistening yellow tomentum, bristly hairs of forehead yellow, those on back of head chiefly yellow. *Thorax* with yellowish-brown tomentum, shoulders reddish. *Scutellum* with yellow bristles. *Abdomen* more covered with grey tomentum, but not densely so, the last four segments black and shining. *Legs* black, but the red at base of femora is more extended, on the hind femora almost the basal half being reddish and the hind tibiæ are partly red in type and other specimens at base. The female is always rather slender, not much stouter than the male.

Microstylum nigrimystaceum, ♂ ♀, sp. n.

Types (male and female) from Portuguese E. Africa (presented Imp. Bur. Ent.).

A species wholly black, at once distinguished by the black moustache. Thorax lighter in colouring than the rest of the insect, covered with grey tomentum, leaving the black stripes very apparent.

Length, ♂ 23, ♀ 23–27 mm.

Male.—Face covered with glistening yellow tomentum. *Moustache* of a few stout black bristles with finer hairs between, a few pale hairs near the mouth at sides. Palpi with black bristles, all hairs and bristles on antennæ and forehead black, also on hind part of head. Beard white. Collar with white hairs. *Thorax* and breast-sides almost blue-black, covered with grey tomentum, the pubescence on dorsum of thorax fine, white, and short, some black hairs on anterior border and on the shoulders, more bristles than hairs, all bristles black. *Scutellum* with black bristles, some very long. *Abdomen* black, with traces of lighter colour at the segmentations and with a very little grey tomentum at sides. *Genitalia* black and dull red, with tawny hairs at apex. *Legs* black, pubescence and bristles black, the coxæ covered with grey tomentum and white hairs and very strong black bristles, under sides of fore and middle femora with white hairs. *Wings* deep smoky-grey.

Female identical, but not so black; the shoulders and sides of *abdomen* reddish, the last three segments shining black. *Legs* very largely dull red, tibiæ almost wholly so, and under part of femora. *Wings* a little paler.

Microstylum hirtipes, ♂ ♀, sp. n.

Type (male) from Deelfontein, S. Africa (*Col. Sloggett*). Type (female) from Cape Colony.

In South African Mus. Col., 1 male. Paratypes from Cape Colony, and 1 female from Kimberley and Cape Colony.

A fine species which does not seem to have been described before, with bright reddish-yellow legs, the abdomen covered with dense grey tomentum and pubescence, the legs with longer pubescence than is usual in this genus.

Length, ♂ 30–35, ♀ 23–29 mm.

Male.—*Face* reddish, covered with whitish or yellowish tomentum. *Moustache* composed of longer yellow bristly hairs and shorter white hairs, placed on a round tubercle, not round the oral opening, and fairly thick. *Antennæ* black, the first two joints with bristly short white hairs, the third joint longer than the first two joints together, narrow at base. Forehead the same colour as face, with long white hairs at sides and at vertex. Hind part of head and collar with white hairs. *Thorax* black with grey tomentum, through which appear two black median stripes; pubescence short, yellow; all bristles whitish. *Scutellum* blackish with grey tomentum and long yellow bristles on posterior border, a few white hairs on dorsum. *Abdomen* blackish, but appearing grey, being covered with grey tomentum and close grey or white pubescence; the posterior borders of segments are marked slightly by absence of tomentum and are blackish brown, with a trace of fulvous colour. *Genitalia* blackish or reddish brown with dirty white or yellow pubescence, becoming long hairs at apices of forceps; under side of abdomen shows reddish-yellow segmentations. *Legs* bright reddish yellow, femora with a black stripe, the hind pair almost wholly black; the middle and hind tibiæ are reddish brown, almost black in the type, the hind tarsi sometimes a little darker; the fore legs are lighter in colour than the others; pubescence on legs entirely white, long on under sides of femora and tibiæ; all bristles white, very numerous and stout, especially on the tarsi. *Wings* clear, tinged with brown, the veins blackish brown.

Females are darker in colour and smaller in size, the *abdomens* especially, but this may be owing to denudation, as they are not in good condition, the last three or four segments are shining black, covered with short white pubescence, sides dull reddish, covered with white tomentum. *Legs* with shorter pubescence, no long hairs below, bristles as numerous.

This species must be nearly allied to *Microstylum sagitta*, ♂, Bigot, but the author states that the tibiæ and tarsi are blackish, only reddish at the base, and that it measures 37½ mm.

Oratostylum, gen. nov.

This genus, formed for a species from Rhodesia, is at once distinguished from *Microstylum* by the distinct, one-jointed, not very short style on the third antennal joint; in *Microstylum*, Loew states it is rudimentary and Verrall says that it is absent—in any case, it is very short; in *this* genus it is about the length of the small second joint, cylindrical with a small blunt spine at its apex, the third joint itself long, nearly twice as long as the first two joints, it also differs from *Microstylum* by the presence of a distinct large tubercle on the face. It is allied to Loew's genus in its venation of the *wing*, though the second posterior cell bulges to a less degree into the first posterior cell, which is only narrower on its upper half to a very small degree and is open wide at the border; the first posterior cell must be designated as open or closed, usually open, but in one male specimen from Umguza River it is closed with a very short stalk at the border, and in a female from Bulawayo it is only narrower at the border. *Moustache* is large, reaching nearly to the antennæ. It may be distinguished from *Dasypletis*, Loew, by the normal length of the pulvilli and by the much less bristly appearance of the abdomen and legs, and by the venation of the wing, the posterior cell not being closed far from border. This fly bears in general appearance a very close resemblance to a *Promachus* species, such as *Promachus cinereus*, sp. n., but, of course, is at once distinguished from it by the venation of the wing.

Oratostylum lepidum, ♂ ♀, sp. n.

Type (male) from Matapos, S. Rhodesia. Type (female) from Forest Vale, S. Rhodesia, and a male.

One male from Umguza River, S. Rhodesia (*R. Stevenson*).

♀ paratype from Bulawayo in Brit. Mus. Coll.

Two males and one female from Bulawayo and Bindaro, Rhodesia, in South African Museum Coll.

A neat, rather pubescent, black species with white bands on the abdomen. *Legs* black, tibiæ and tarsi partly reddish.

Length, ♂ 17–19, ♀ 14 mm.

Male.—*Face* black, below the *antennæ* reddish with grey tomentum. *Moustache* dirty white, composed of many long coarse hairs. Proboscis large, with some soft white hairs below. *Palpi* with very short whitish hairs. Beard of soft white hairs. *Antennæ* blackish, the first two joints short with many hairs of the colour of the moustache on their lower sides, the third, dull reddish at the extreme base, is long and cylindrical with short stout style which ends itself in one or more very small spines. Forehead black with four stout black bristles on each side and shorter ones on the ocelligerous tubercle. Hind part of head at vertex with pale yellowish bristles, in one of the males the bristles of forehead are mostly yellowish. *Thorax* brownish black with some greyish-brown tomentum, the median stripe distinct, divided by a grey tomentose line, such stripes indistinct, a grey tomentose zigzag stripe is very noticeable running from below the suture on each side to the border of the dorsum, two grey spots are also present anteriorly below the shoulders which are reddish with grey tomentum and reddish-yellow bristles; pubescence on dorsum chiefly black, short, with many stout black bristles on the posterior half; præsutural bristles reddish yellow, three in number, the two supra-alar are black. Breast-sides blackish brown with grey tomentum and whitish hairs. *Scutellum* black with grey tomentum, and its posterior border with a fringe of reddish-yellow weak bristles. *Abdomen* with eight segments, but the first two are very much contracted, black with pale grey segmentations covered by thick white hairs, with black hairs behind, the pubescence black, rather long, sides with black and white hairs, on the third segment they are black and tuft-like, also black on the fourth segment, the last segment is entirely black with a scanty fringe of white hairs. Underside black with white hairs. *Genitalia* reddish brown with long rusty-yellow hairs, upper pincers appear rather shorter than the lower pair. *Legs* with black femora, reddish at the extreme apices, tibiæ reddish on their basal halves, then usually black: tarsi reddish, the last joint black, the femora with white pubescence, very long below, thickest on the fore pair; tibiæ with white pubescence, the fore pair with black bristles and four very stout yellow ones on the outer sides; the middle tibiæ armed with these long bristles, chiefly yellow on each side and on the dorsum with stout short black ones, the hind pair with longer white pubescence and fewer long bristles, all white; tarsi with white pubescence and yellow bristles. *Wings* hyaline, veins brown, the small transverse vein above the middle of the discal cell, anal cell closed at border.

Female identical, but smaller. *Face* almost entirely red. Forehead with bristles the same colour as the moustache, not so stout as in male. Bristles on thorax chiefly yellow. *Abdomen* has the last three segments entirely black, with short scanty white pubescence, spines of ovipositor reddish. Fore femora with short yellow bristles below, fore tibiæ with two rows of long yellow bristles, the middle pair with the same, but no stout black ones on the dorsum; the anterior and middle tibiæ and tarsi almost wholly reddish, and rather larger in size than those of the male.

Daspletis vulpes, Loew.

Öfvers. Kongl. Vet.-Akad. Forhandl. xv. 337, 4 *bis* (1858); id. Dipt. Sud Afrik. ii. 91 (1860).

A male from Livingstone, N.W. Rhodesia (*Dr. A. Douglas*), in poor preservation, and a female from the same locality in Brit. Mus. Coll.

Loew described the male only, the female is very much paler in the colouring of the pubescence; the *moustache*, bristles on hind part of head, and pubescence on the first two joints of *antennæ* is pale reddish yellow, the hairs on side of *face* and the beard a dirty white. The bristles and hairs on the *legs* range from dirty white to pale reddish yellow, the fox-red bristles of the male are only represented by the bristles at the sides and posterior border of thorax, and are not quite so numerous or so long as is the case on those of the legs.

Abdomen much barer, with no thick pubescence below. *Ovipositor* with a circlet of spines. Both male and female have reddish antennæ (imperfect), not black as Loew states.

Daspletis hirtus, ♂ ♀, sp. n.

Type (male), and type (female), also another male from Saw Mills, S. Rhodesia (Rhodesia Museum).

Length, ♂ 16, ♀ 17 mm.

A smaller paler species than *Daspletis vulpes*, Loew, the only recorded species of the genus, but in all generic characteristics the same.

Male.—*Face* covered with greyish-white tomentum. Moustache, composed of many yellowish-white bristly hairs, reaches the antennæ, the tubercle extends the length of the face. Beard and hairs of palpi whitish. *Antennæ* reddish yellow, the first two joints paler, with short pale bristles on upper side, and longer ones below, the third joint club-shaped, elongated, the style very small. *Forehead* furrowed in centre, with pale hairs at sides, the ocelligerous tubercle protuberant with long pale yellow bristles, those on the hind part of head and on collar the same colour. *Thorax* blackish, but covered with greyish-yellow tomentum, and with short pale bristles, through which two narrow black stripes are faintly discernible, sides with long pale yellow bristles; on the posterior border of the thorax a median short stripe of white hairs, some long black bristles are present on the dorsum of thorax. *Scutellum* the same colour as the thorax, with long pale bristles.

Abdomen blackish, but densely covered with short yellowish-white pubescence extending to the genitalia, which are similar to those of *Daspletis vulpes*. *Legs* pale yellow, femora black, only their apices yellow, with long pale hairs, which are long and thick below; tibiæ and tarsi with less pubescence of the same colour, and all bristles pale. Pulvilli in this species are long, not quite reaching the end of the claws. *Wings* hyaline, veins reddish brown, venation as in *Daspletis vulpes*, the first and fourth posterior cells being both closed, the small transverse vein beyond the middle of the discal cell.

Female similar, but with far less pubescence. *Thorax* with narrow brown stripes discernible, the yellow bristles more reddish in colour. *Abdomen* paler, with only short close-lying pale pubescence, the last segments reddish yellow. Femora with only a black stripe above.

NEODYSMACHUS, gen. nov.

This genus is formed for one species from Cape Colony, being very nearly allied to Loew's genus *Daspletis*, but distinguished from it by the first posterior cell of *wing* being open, the same width throughout, and the second posterior cell does not encroach on it, the veins closing the discal and fourth posterior cells are more parallel. The tubercle of the face is more pronounced, and the moustache does not quite reach the antennæ. The *genitalia* are smaller, the under pair of pincers being much smaller and apparently different in shape. This genus and *Dasyllis* are curiously allied in general appearance to *Dysmachus* in the Asilinæ, though they do not possess the typical mane of that genus.

Neodysmachus setithoracicus, ♂ ♀, sp. n.

Types (male and female), two females and another male, all from Willowmore, Cape Colony (*Dr. Braun*), presented to Brit. Mus. Coll. by Imperial Bureau Entomology.

A female from Saw Mills, S. Rhodesia.

A pale-coloured species, owing to the thick short whitish pubescence and bristles on the body, especially in the males, the females appearing darker with less dense pubescence on the abdomen. Antennæ and legs reddish yellow.

Length, ♂ 16, ♀ 16–18 mm.

Male.—*Face* covered with dense pale tomentum above, sides and tubercle reddish yellow, the tubercle roundish, protuberant, sides of face raised, so that the lower part of face is wholly protuberant. Moustache composed of dense, long, almost silky-white hairs; there is a distinct narrow space devoid of hairs between the tubercle and the antennæ. *Forehead* the same as the upper part of face, with long white hairs at the sides, ocelligerous tubercle also with white hairs. Hind part of head with dense white hairs. Beard of the same colour. *Palpi* reddish yellow with whitish-yellow hairs. Proboscis prominent, blackish. *Antennæ* reddish yellow with short white hairs on upper side, and long ones on the lower side, the third club-shaped but flattened, with a hardly perceptible style. Collar with long whitish hairs. *Thorax* blackish covered with yellowish-grey tomentum, and traces of two narrow brown stripes hardly discernible, owing to the rather thick depressed pubescence composed of tolerably long dirty whitish hairs intermingled, and with long weak whitish bristles, most numerous at sides and on posterior part of thorax; shoulders pale reddish, with a bunch of short weak whitish bristles. The præsutural bristles are represented by two fan-like series of long pale yellowish bristles, with about four bristles in each series, the supra-alar bristles are represented by one similar series, and the postalar bristles are very long and numerous, rather tuft-like. Viewed from behind, there is a very distinct short stripe of snowy-white hairs, similar to those in *Dysmachus* species, extending from the posterior part of thorax to the scutellum, which in turn is bordered by numerous very long whitish bristles. Breast-sides with long whitish bristles and hairs, and ashy-white tomentum, the metapleuræ with a thick tuft of weak yellow bristles, intermixed with a few short whitish hairs.

Abdomen brownish, covered with dense dirty-white short pubescence, through which can be seen the reddish-yellow borders of segments very wide at the sides.

Genitalia small, reddish, the upper piece shining reddish brown, oblong, pointed posteriorly. *Legs* pale reddish yellow, the hind femora with a long black stripe above, the coxæ with very thick white pubescence, also present on both sides of the fore femora and on the hind pair, less noticeable on the middle pair; tibiæ and tarsi with white pubescence and long yellowish bristles, a few black ones on the under side of tarsi. Claws not so close-set as in *Daspletis vulpes*, pulvilli about half their length, less than this on the middle and posterior legs. *Wings* hyaline, the middle transverse vein very oblique, situated on the apical third of the discal cell.

Female less pubescent. The two series of præsutural bristles only three in number on each, the dorsum of thorax covered with short whitish bristles, and a double imperfect row of longer yellow bristles on each side of the median line; in the other females some of these are black, the bristles beyond the suture at sides are dispersed fan-like, and are very long and stout, no long white hairs interspersed with them, pubescence on breast-sides shorter and more sparse. *Abdomen* with rather less pubescence, ovipositor with a fringe of reddish-yellow spines. *Legs* darker, the hind legs being almost entirely black, only reddish below, the under bristles on tarsi much stouter and more numerous, dark-coloured, and reddish yellow.

This species in general appearance is very similar to *Daspletis hirtus*, sp. n.

STENOPOGON, Loew.

Dasypogon dilutus, Wlk., from the Cape, belongs to this genus. It appears probable that *Stenopogon holoxanthus*, Hermann, from Cape Colony, is the same species.

GONIOSCELIS, Schiner.

Gonioscelis calopus, Bigot.

Ann. Soc Ent France, (5) viii p. 441 (1878).

Bigot described the female only, from Natal.

There are two males from Estcourt, Natal (presented Govt. Natal), in Brit. Mus. Coll., evidently the males of Bigot's species, which is rather pubescent. Bigot mentioned the rather long whitish hairs on underside of abdomen. A female specimen from Bloemfontein has moderately long black hairs on the anterior half of the thorax, and numerous longer yellow bristles and hairs posteriorly, the fifth and sixth segments of abdomen have no reddish-brown colour. *Scutellum* with six or more long yellow bristles.

Males (types) are smaller, 12–14 mm. Bigot gives 15 mm. for his type, this female is slightly larger.

Abdomen has only the reddish-brown colour on the posterior border of the last segment. *Genitalia* small, bright reddish yellow, the upper pincers with yellow hairs at their apices, the lower shorter ones are similar, pubescence on genitalia yellow, not scanty. *Legs* dull reddish in one type, but in the other similar to the female; bristles on legs are very numerous, chiefly yellow; pubescence yellow, long on under sides of femora. *Antennæ* with style on the third joint similar to those in *G. hispidus* and *G. setosus*.

Gonioscelis femoralis, ♂ ♀, sp. n.

Male (type) from Cradock, Cape of Good Hope (*Miss J. Brinker*).

Female (type) and another from Willow Grange, Mooi River, Natal (*R. C. Wroughton*), presented Imp. Bur. Ent.

A female in bad preservation from Tsumeb, South-West Protectorate, sent me by Mr. Péringuey for identification seems identical, but many of the bristles on the legs are black. A male and female from Saw Mills, Rhodesia (*Dr. Brauns*).

A bare blackish small species covered with grey tomentum, the thorax with pale bristles. *Legs* reddish yellow, the hind femora with a black stripe on the upper side.

Length, ♂ 13½, ♀ 12–13 mm.

Male.—*Face* black with grey tomentum. *Moustache* large and thick, pale, of yellow bristly hairs, yellow hairs above, reaching the antennæ. Palpi with pale hairs. *Beard* yellowish. *Antennæ* black, the first two joints with black hairs, the style on the third joint very short. *Forehead* with brownish-black bristly hairs at sides and posteriorly. Hind part of head with yellow hairs. Collar with yellow hairs.

Thorax blackish brown, covered with greyish-yellow tomentum, median and side stripes distinct, reaching the anterior border of dorsum, but not the posterior one, median divided by a fine line, the side-stripes ending in a spot divided from the stripe itself; pubescence short, black on dorsum, posteriorly longer yellow hairs are intermixed with stout yellow bristles, shoulders and sides with yellow bristles. *Scutellum* covered with grey tomentum, and about six yellow bristles on its hind border. *Abdomen* blackish brown, covered with grey tomentum and very short yellow pubescence, some long yellow hairs at sides of first segment, very obscure reddish segmentations are apparent, more distinct are small median reddish-yellow spots on the last four segments. *Genitalia* small, mahogany-coloured, the upper pincers short, stout, with yellow hairs, the lower pair shorter, pointed, all with short yellow hairs. *Legs* reddish yellow, under side and base of fore coxæ black; pubescence on legs short yellow, with longer weak bristles on the outer and under side of the fore tibiæ; bristles almost entirely yellow.

Wings clear, tinged pale brown, paler on the posterior border.

Female identical. *Abdomen* shows no red colour, but the last two segments are reddish brown, shining. Fore coxæ are not black. *Wings* clear, hardly tinged.

Gonioscelis pruinosus, ♂ ♀, sp. n.

Types (male and female) and two other females from Narok, Masai Reserve, B.E. Africa (*Capt. A. C. Luckman*).

A species distinguished by the black moustache in the male and by the short stout genitalia. *Abdomen* reddish brown, but covered with hoary tomentum and with grey side-stripes, in certain lights a very distinct pruinose bloom is seen in both sexes, more distinct in the female. *Legs* reddish. *Antennæ* black.

Length 13 mm.

Male.—*Face* and forehead with glistening greyish-brown tomentum and with black hairs. *Moustache* black, reaching to the *antennæ*, which have very long black hairs on the first two joints, the third joint has the style only represented by a spine, as in *G. nigripennis*, sp. n.

Hind part of head with scanty yellowish hairs. *Thorax* covered with yellowish-brown tomentum, leaving a shining blue-black broad stripe apparent, with also distinct side-stripes, dorsum almost bare of pubescence, but with numerous black bristles on the posterior half. Shoulders reddish, with black and yellow bristles. Collar with yellow bristles. *Scutellum* covered with pale tomentum, and with two stout ? black bristles. *Abdomen* short, tomentum on dorsum whitish, grey at sides, forming a stripe; pubescence very short, chiefly yellow. *Genitalia* yellow-ochre in colour, the upper pincers long, stout, with yellow hairs, and two stout black bristles at their apices, the lower shorter pair also with these at their apices, but yellow, pubescence otherwise yellow, the last segment of the abdomen is the same colour as the genitalia. Under side of abdomen blackish, with grey-yellow tomentum and very short yellow pubescence. *Legs* reddish yellow, with short white pubescence and black bristles, the inner side of the fore femora black; fore tibiæ with two yellow bristles at base on the outer side. *Wings* clear with yellow veins.

Female in better preservation is identical. *Moustache* of long pale yellow bristles, not so thick, with shorter yellow hairs above, reaching the antennæ, which have black bristly hairs on the first two joints. *Thorax* with some yellow bristles at the sides, and a few yellow ones intermixed with the black ones posteriorly. *Scutellum* has two yellowish bristles. *Abdomen* reddish brown or blackish brown, densely covered with tomentum, the last three segments bare, reddish brown. Hind femora dusky at base on the under side.

The species is distinguished from *Gonioscelis hispidus* and *setosus*, Wied., in which the moustache is black in the males, by the comparatively bare thorax and by the almost wholly reddish-yellow legs.

Gonioscelis rufescens, ♂ ♀, sp. n.

Types (male and female) and another male from Saw Mills, Red Bank, and Bulawayo, S. Rhodesia.

A reddish-yellow species, the coxæ blackish, thorax blackish, covered with yellowish-grey tomentum and with a median and side stripes. *Antennæ* black.

Length, ♂ 9–14, ♀ 16 mm.

Male.—*Face* black with greyish tomentum, the moustache, beard, and hairs round head bright orange-yellow, the moustache thick, extending halfway up the face, tubercle large, below the antennæ a thick tuft of the same-coloured hairs. Palpi black with yellow hairs. *Antennæ* black, the first two joints with black hairs, most numerous on the under side, the style on third joint only represented by a spine. *Forehead* with black long hairs on the ocelligerous tubercle and orange-yellow hairs behind. *Thorax* with pale reddish-yellow shoulders; pubescence yellowish, but very short; the long bristles all yellow, three præsutural bristles present; sides with some short yellow hairs; the median stripe divided, the long indistinct stripes are only divided from it by a narrow tomentose line. *Scutellum* same colour as thorax, with short yellow bristles on its posterior border. *Abdomen* rather shining reddish yellow, the first segment and anterior half of the second segment blackish with grey tomentum, the first segment with yellow hairs on its posterior border, thickest at the sides, pubescence elsewhere short golden yellow, sides of abdomen darker, covered with grey tomentum. *Genitalia* short, same colour as abdomen, the upper pincers stout at their points with long dark bristles and yellowish pubescence elsewhere, the under pair stout, shorter; under side of abdomen reddish yellow. *Legs* with black bristles, one or two yellow ones on the fore tibiæ; pubescence short, yellow; the last joint of the tarsi blackish; coxæ covered with grey tomentum and with longer yellow hairs, the fore pair with the typical enlarged base armed with many short black bristles. *Wings* pale brownish, tinged yellow on the fore border, the small transverse vein on the basal third of the discal cell; the brown colour is most intensive on the marginal, first posterior, and discal cells.

Female identical. *Abdomen* with more greyish tomentum. Hind tibiæ blackish at their apices. *Wings* paler, grey, tinged yellow. Ovipositor with stout reddish spines.

The species from Abyssinia named by Jaennicke *Stenopogon macquarti* evidently belongs to this genus from his description, and must be nearly allied to the above new species, but the antennæ are not wholly black, the wings are yellow not brownish, and the bristles on the tibiæ and tarsi are stated to be pale yellow in colour.

Gonioscelis nigripennis, ♂ ♀, sp. n.

Type (male) from Erikson's Drift, Kumene River. A female from same locality, and another female from Otjimbumbe, Kumene River, S.W. Africa, in South African Museum Coll.

Type (female) from Erikson's Drift, in Brit. Mus. Coll.

An easily distinguished species by its blackish wings and abdomen, the latter with some grey markings. *Legs* black, fore tibiæ, and fore and middle tarsi dull reddish. Male with long genitalia.

Length, ♂ 15, ♀ 15–16 mm.

Male.—*Face* shining black, some brownish tomentum at sides below the antennæ. *Moustache* wholly black, composed of long bristly hairs. Palpi with few black hairs. A tuft of similar hairs below *antennæ*, which are defective. *Forehead* black with black bristles on the ocelligerous tubercle, and on hind part of head, these last curving over. Beard black. *Thorax* black, shining, with no stripes visible; pubescence black, with black bristles posteriorly. *Scutellum* with two or more black bristles. *Abdomen* shining black, almost bare but with some short black pubescence, segmentations grey tomentose and on dorsum of the first two segments. *Genitalia* black, shining, the upper pincers long ending in a point which bears three strong black bristles, under ones shorter, likewise armed with bristles; pubescence black, fairly thick. *Legs* black with black bristles, on the reddish parts they are red, femora reddish at their extreme apices, and hind tibiæ at their base. *Wings* blackish brown, with blackish veins, the small transverse vein below the middle of the discal cell.

Female identical. *Antennæ* blackish, the first two joints with black hairs, the third long, with a very small style, which appears bifid as a spine on the outer edge, but only the female type has them perfect. *Abdomen* wholly black on the last two segments. *Legs* vary in colouring, the hind tibiæ in one female are largely reddish and obscurely so in the type, all the females have the hind tarsi reddish.

Gonioscelis longulus, ♂ ♀, sp. n.

Type (male) and two females from M'fongosi, Zululand (*W. E. Jones*), in South African Mus. Coll.

Type (female) from the same locality in Brit. Mus. Coll.

A species distinguished by the genitalia in the male, which are long with a tuft of long yellow hairs on the upper pincers. Blackish but covered with grey tomentum, the last segments of abdomen reddish. Legs bright reddish yellow. Wings greyish, with reddish-yellow veins.

Length 17 mm.

Male.—*Face* blackish, with grey tomentum. *Moustache* thick, composed of coarse yellow hairs, a bunch of similar hairs below the antennæ. Beard of softer yellowish hairs. *Antennæ* black, with black bristly hairs on the first two joints, the style on third joint very short. Forehead with the same hairs on the ocelligerous tubercle. Hind border of head and collar with yellow hairs. *Thorax* as in *Gonioscelis femoralis*, sp. n., but the median stripe is narrower and the side-stripes do not reach the anterior border; shoulders shining red with some yellow hairs. *Scutellum* with four weak yellow bristles on its posterior border. *Abdomen* long and narrow, covered with grey tomentum and with some very short yellow pubescence; the segmentations appear obscurely reddish yellow, and the last two segments are shining reddish brown with, however, yellow pubescence. *Genitalia* reddish brown, with obscure black markings; the upper pincers long with pointed apices, on which the tuft of reddish-yellow bristles are conspicuous, the under shorter pair have them also; pubescence on genitalia yellow, short, and scanty. *Legs* bright reddish yellow, with a short black stripe on the inside of the fore femora; coxæ covered with grey tomentam and pale hairs, very thick on the fore pair, hind legs black at the basal joint forming the coxæ, and slightly so at the apex, tarsi also blackish at the apices of the joints; pubescence on legs scanty, short, and yellow; bristles yellowish white, not very numerous, the usual strong black ones on the enlarged fore coxæ are present, and also some six or more stout bristles on the outer side of the fore tibiæ; a few black bristles also on all the tarsi. *Wings* with the small transverse vein below the middle of the discal cell.

Female identical, the reddish-brown colour on the *abdomen* extends on to the sixth segment on the middle of dorsum only, and even as a spot on to the fifth segment. Fore tibiæ have some black short bristles on the underside.

The species is distinguished from *G. femoralis* by the genitalia, also by its more slender shape and more uniformly coloured legs.

Gonioscelis genitalis, ♂ ♀, sp. n.

Type (male) from Ongaudjera, in Brit. Mus. Coll.

Type (female) from Olinga, S.W. Africa, in South African Mus. Coll.

A species allied to *G. longulus*, sp. n., in the length of the genitalia, but a much more pubescent species. Legs chiefly black with white bristles.

Length, ♂ 18, ♀ 19½ mm.

Male.—*Face* blackish, with grey tomentum. *Moustache* large, composed of coarse yellowish hairs on the tubercle, two tufts of the same hairs at base of antennæ join it.

Palpi and underside of proboscis with yellowish hairs. Beard the same colour. *Antennæ* blackish, the first two joints with bristly black hairs, the third joint wanting. Forehead with long black bristly hairs. Hind part of head with yellow bristles and hairs. *Thorax* and *abdomen* blackish, appearing lighter, being covered with greyish-yellow tomentum; stripes on thorax distinct, the median one divided, reaching the scutellum, the side-ones not attaining the anterior border, bristles on dorsum and at sides long, yellow, a row of black curving over bristles on the median stripe in the middle; pubescence chiefly yellow, very short, sides with grey tomentum. *Scutellum* with a fringe of yellow bristles. *Abdomen* grey tomentose at sides, with short yellow pubescence, longer below; the *genitalia* bright reddish brown, blackish at the long apices which end in long black bristles, three long ones and some shorter ones; pubescence on genitalia yellow. *Legs* black, the under side of fore and hind femora, and the whole of the tibiæ and tarsi on their upper sides reddish; pubescence on legs yellow; bristles chiefly yellow, black on under sides of the fore legs. *Wings* clear, with yellowish veins.

Female identical. The third joint of *antennæ* long, cylindrical, with a pointed style. The pale yellow hairs on the coxæ almost more numerous than in the male.

ANCYLORRHYNCHUS, Latr.

Among the Asilidæ returned from the late Dr. Hermann are two males from N. Nigeria determined by him as *Ancylorrhynchus nomada*, Wied., described by the author under the genus *Syclaticus* from an unknown locality.

A. nomada may therefore be now added to the list of the South African species.

Laphria fortipes, Walk., from Natal, belongs to this genus. It is a small red-brown species with white spots on the second segment of abdomen and with red legs. Wings dark at apex. Type is a male.

Scylaticus varipennis, ♂ ♀, sp. n.

Type (male and female) from M'fongosi, Zululand (*W. E. Jones*), in South African Mus. Coll.

Paratypes (male and female) from same locality, in Brit. Mus. Coll. (Presented S. Afr. Mus. Coll.)

A small, blackish, rather pubescent species. Legs and antennæ reddish yellow. Moustache white. Wings shaded slightly on the transverse veins.

Length, ♂ 8–9, ♀ 9–11 mm.

Male.—*Face* densely covered with whitish tomentum and with rather long dirty white hairs. Beard, forehead, and the hairs on the under side of the first two joints of antennæ similar in colour. *Antennæ* dull reddish, the first two joints rather darker. *Thorax* black, shoulders reddish yellow; pubescence rather long, consisting of soft dirty whitish hairs, with bristly long hairs at sides and on posterior part of thorax. Breast with yellowish-brown tomentum. *Scutellum* black, with a very thick fringe of bristly whitish hairs on its posterior border. *Abdomen* black, with ashy-grey bands on each segment, widest at the sides, hardly extending to the median line, with the exception of the last two segments which are almost wholly ashy-grey, on the fourth and fifth segments a dull reddish colour invades the grey bands, being broadest in the middle; pubescence rather thick, of dirty white hairs and pale yellowish hairs at the sides; *genitalia* black, small. *Legs* light reddish yellow, the femora black on their upper sides; pubescence short and scanty, consisting of short pale yellowish hairs, all bristles reddish yellow. *Wings* hyaline, veins yellow, the small transverse vein in the middle of the discal cell.

Female identical, the shading on the wings rather more intensive.

The dull red colour of abdomen is chiefly present on the fifth segment, but the last segment is wholly red. In the other female the red colour is present on the last four segments, and two narrow grey tomentose stripes are distinct on the thorax.

Dasypogon lævinus, Walk., belongs to this genus "from S. Africa." It is a small species near *Scylaticus costalis*. Wings yellowish, hyaline, in very bad preservation.

HABROPOGON, Loew.

This genus has not yet been recorded from S. Africa, but one species from the Canary Islands by Becker and one species by v. d. Wulp from Aden have been described. This new species agrees in general characters with Loew's definition, but has no resemblance to the species of *Stenopogon*, not being of a long slender shape as Loew states, and the antennal third joint is long and cylindrical, as is the case in *Habropogon pertusus*, Becker, from the Canaries, mentioned in the author's description as rather exceptional in this genus.

Habropogon rhodesii, ♂ ♀, sp. n.

Types (male and female), and another from Bulawayo (*R. Stevenson*, 1923).

A handsome rather pubescent species with ash-grey bands on the black abdomen, orange-yellow in the male at apex. Legs black with dirty white pubescence.

Length, ♂ 13, ♀ 13½ mm.

Male.—*Face* olive-green, with pale tomentum at sides and a spot below the antennæ. *Moustache* composed of coarse whitish numerous long hairs, taking up about half the face and not situated on any distinct tubercle. *Palpi* black, with long white hairs. *Antennæ* blackish brown, the first two joints with whitish hairs, the third long cylindrical, with a distinct style. Forehead not wider posteriorly, with some whitish hairs, long on the ocelligerous tubercle. Hind part of head with whitish-yellow weak hairs, proceeding round the head to beard, which is whiter. *Thorax* rather convex, brown with no distinct stripes, covered with reddish-yellow hairs becoming bristly posteriorly and longer, but no real bristles are present, and with reddish-brown tomentum; collar and prothorax also covered with pale yellow hairs. *Scutellum* with long pale yellow hairs. *Abdomen* black, with grey bands on the posterior borders of the eight segments, from the fourth onwards these bands are bright reddish, almost orange-yellow, the last three segments entirely so, the last segment being very small, pubescence on the bands matches their colour, at sides it is short, white, the black parts also have pale pubescence; under sides with numerous white hairs. *Genitalia* conspicuous, though the pincers are covered by large triangular pieces, blackish brown covered with brown tomentum, pubescence pale. *Legs* black, with long and short white pubescence and some weak white bristles only on the tibiæ, and some black and white ones on the tarsi; femora with some bristly hairs; the metatarsi on the fore and middle legs hardly longer than the next joint, and on the hind legs as long as the next two together. *Wings* hyaline, the fourth posterior cell open, though somewhat narrowed, anal cell also open.

Female with all the bands on the black *abdomen* grey, the seventh and eighth segments wholly black, pubescence all pale, ovipositor with reddish-brown spines. *Thorax* with long though weak reddish-yellow bristles at sides and posteriorly. *Legs* rather more bristly, the fore and middle tibiæ reddish brown above, as are the tarsi, even those of the hind legs.

CYRTOPOGON, Loew.

No species has been yet recorded from the continent of Africa.

Cyrtopogon africanus, ♂ ♀, sp. n.

Type (male) from Cape Colony.

Paratypes (females) from Gt. Windhoek, Tulbagh, 4500 ft., Cape Colony, in South African Mus. Coll.

♀ paratype, one presented to Brit. Mus. Coll.

A black species with brown wings, reddish legs, and dull orange-yellow pubescence on the thorax and under side of abdomen.

Length, ♂ 12, ♀ 10–11½ mm.

Male.—*Face* shining black, with traces of grey tomentum at sides. *Moustache* composed of long black hairs on the fairly large tubercle, which almost reaches the antennæ; some long orange-yellow bristly hairs are present below the black hairs at sides of oral opening. *Antennæ* black, the second joint with some brown tomentum, the third joint long with a short style ending in the hair-like bristle peculiar to the genus, the first two joints with long bristly black hairs. Forehead black and shining, with black hairs. Hind part of head, beard, collar, and breast-sides with bright orange-yellow hairs. *Thorax* black and shining, with two rows of hairs, and sides with a series of bristles and fine hairs, the former disposed in a fan-like shape, and on the posterior border of thorax is a very dense long tuft of hairs, all these the same colour as the beard. *Scutellum* black with a border of orange-yellow bristles. *Abdomen* entirely black, punctuated, bare above, but below with dense orange-yellow pubescence; a tuft of these appear on the first segment above. *Genitalia* with rather long black upper pincers ending in a point with black hairs beyond, and black hairs mixed with a few yellow ones above. *Wings* brown, lighter on the fore border, anal cell closed at border. *Legs* deep red with black bristles and long black hairs on the fore coxæ and lower sides of femora and tibiæ; on the other coxæ the hairs are orange-yellow, and some appear on the under side of the hind legs.

Females identical, but the pubescence on thorax and elsewhere is not quite so thick. Ovipositor with stout red spines.

Stichopogon unicolor, ♂ ♀, sp. n.

Types (two males) from Bulawayo (Rhodesia Museum).

Type (female) and another from Pretoria (*G. A. H. Bedford*), in Brit. Mus. Coll.

A small species at once distinguished by the wholly black legs, rather exceptional in this genus. Prof. Bezzi, in describing the characteristics of the genus, states the legs are wholly or partly red (Ann. Mus. Hung. viii. pp. 134–147, 1910). Abdomen with a whitish tomentose band on the fourth segment.

Length, ♂ 4–5, ♀ 6 mm.

Male.—*Face* with silvery-white tomentum and *moustache*, this last consisting of not very many fine white hairs. Beard the same colour. Forehead with a white tomentose band posteriorly, hairs pale, the bristly hairs at back of head black. *Thorax* rather shining black with ashy-grey tomentum and distinct pale pubescence on dorsum, bristles at sides black, breast-sides covered with whitish tomentum. *Abdomen* blue-black, shining, the first segment with a large grey tomentose triangular spot at sides, its apex resting on the posterior border, the band on the fourth segment consists of similar spots with their apices only joining on the anterior border in centre, the last two segments covered with ashy-grey tomentum; sides of abdomen with long pale hairs. *Genitalia* small. *Legs* black with grey tomentum and pubescence, the long fine bristles white and black, the white bristles chiefly on the tibiæ. *Wings* clear, iridescent, venation as in *Stichopogon punctum*, but the fork of the third vein is narrower and longer, reaching almost to the apex of the discal cell; veins blackish, the small transverse vein on the lower third of the discal cell.

Females identical. The tomentum on face, forehead, and thorax is yellowish brown, not silvery white or ashy grey. *Abdomen* with last segment ashy grey, the ovipositor spines black.

Stichopogon auctus, Bezzi, from South Tunis, has also wholly black legs, and the three submarginal cells figured and described by the author are also present in the two male types of this species, but not in the females.

Spanurus pallidus, ♂ ♀, sp. n.

Types (male and female) and others from Kumene River and other localities in S.W. Africa in South African Mus. Coll. and Brit. Mus. Coll.

A species allied to *S. tellinii*, Bezzi, but distinguished by the paler yellow pubescence and by the reddish tibiæ of the fore legs. From *S. compressus*, Karsch, from Angola, it may be distinguished by the black bands on abdomen bordered with grey tomentum and by the yellowish (not red) pubescence of abdomen.

Length, ♂ 7–9, ♀ 10 mm.

Male.—Face black, with grey tomentum. *Moustache* yellowish white, hairs on forehead and back of head, on *thorax* and *scutellum* whitish, the bristles whitish. *Abdomen* with bands as in *S. tellinii*; the pubescence, rather scanty for species of this genus, is chiefly whitish, yellowish on the crest of the abdomen and on the last segment. *Genitalia* black, with yellowish hairs; underside of abdomen with white hairs. *Legs* reddish yellow, the femora black, the hind and middle pair only reddish yellow at their extreme apices, but in the fore pair the lighter colour extends below nearly to the base and on the apical half, leaving only a narrow stripe of black colour above at apex; the hind and middle tarsi almost entirely reddish yellow; pubescence and bristles on legs white. *Wings* clear, the fore veins yellow, the fourth posterior cell slightly narrower at border.

Female identical, the last two segments of *abdomen* black, shining. *Antennæ* in all the specimens have the third joint destroyed, the first two joints blackish with yellowish-white hairs.

Lamyra versicolor, ♀, Hermann, *in litt.*, sp. n.

Type (female) from Orange State in South African Mus. Coll. labelled *Lamyra versicolor*, H.

Paratype (female) from Springvale, S. Rhodesia.

A species belonging to the short-legged division of the genus, probably allied to *Lamyra angularis*, Loew, but at once distinguished by the entirely reddish-yellow legs with the same-coloured pubescence and bristles, and by the reddish bristles on the palpi.

Length 13–14 mm.

Face reddish yellow, lighter in colour than the legs and antennæ, with yellow pubescence and *moustache*; lower part of face black. *Palpi* and forehead black. Beard scanty, white. *Thorax* rusty-red, with a broad black band extending as a narrow median stripe to the anterior border; dorsum bare with hardly perceptible small bristles, those at the sides long and reddish. *Scutellum* reddish, bare, no bristles on its posterior border. *Abdomen* rather broad, short, finely punctuate, some reddish bristles at the sides; dorsum almost bare; ovipositor reddish yellow, the last segment in the other female the same colour. *Legs* uniformly reddish yellow, the coxæ black. *Wings* deep smoky grey, lighter at the base, small transverse vein below the middle of the discal cell. Venation as in *L. gulo*, the upper branch of the third vein very much curved inwards.

Nusa africana, ♂ ♀, Hermann, *in litt.*, sp. n.

Among the species returned to the Imp. Bur. Ent. after the late Professor's death are five specimens of this species—the female type with label of name and *typus* on it. This is the first species of the genus recorded from South Africa, with the exception of a species described by Corti as (?) *Andrenosoma boranica* from E. Africa; the antennæ being destroyed he was doubtful of the genus; he stated it was a wholly black species 8 mm. in length.

This species agrees with the diagnosis of the genus given by Hermann in Nova Acta Abh. Kaiserl. Leop. Carol. Deutsh. Akad. Naturf. xcvi. (No. 1) p. 239 (1912).

Types (male and female) and three females from Mt. Mlanje, Nyasaland (*S. A. Neave*).

A large, very stout species with a black thorax, reddish-brown abdomen and legs, and brownish wings.

Length, ♂ 20, ♀ 24–28 mm.

Male.—*Face* and cheeks black, shining, facial tubercle very large. *Moustache* chiefly of long whitish hairs, three or four long black ones above, and continued to the base of antennæ are fairly long yellowish-white hairs also with a few rather bristly black hairs; cheeks, beard, hairs on proboscis and palpi soft and white. Hind part of head with short black hairs. Forehead with two small tufts of white hairs in the middle and black hairs at the sides. *Antennæ* destroyed. *Thorax* dull, almost bluish black, with black bristles and hairs, some short white pubescence on shoulders. *Scutellum* bluish black, with short black pubescence and long weak bristles on its posterior border. *Abdomen* bright mahogany-brown, with short golden-yellow pubescence on the segmentations and a few on the dorsum of segments; on the first segment are tufts of black hairs at the sides. *Genitalia* short, with reddish-yellow pubescence, some long hairs above and another tuft below. *Legs* the same colour as the abdomen, with the same-coloured pubescence, long on the under side of the femora and tibiæ, especially so on the two anterior pairs; tarsi with shorter pubescence and a few reddish-yellow bristles; one or two long bristles at the apices of tibiæ; coxæ black, with long white hairs. *Wings* with the first posterior cell well open, the fourth closed, the small transverse vein below the middle of the discal cell. Colour of wings brownish, becoming lighter in the base of anal cell and with paler spots in the cells on the posterior border.

Female.—*Moustache* and hairs above black, the lower half of moustache with many white hairs. *Antennæ* blackish brown, with the small second joint and the third joint rather flat and large, ending diagonally, no spine visible, the bristles and hairs on the first two joints black. *Abdomen* with more reddish-yellow pubescence at the sides, the *ovipositor* as long as the breadth of the penultimate segment; on the first segment at sides beyond the black tufts of hairs are two or more long, not very stout bristles. *Legs* with not quite such long pubescence and with more numerous bristles, some on the underside of the hind femora and at their apices, also two at apices of middle tibiæ, the fore tibiæ with a very thick brush of golden-yellow hairs on their inner sides, much more distinct than in the male.

Laphria aureopilosa, ♂, Ricardo.

Ann. & Mag. Nat. Hist. (7) vi. p. 172 (1900).

In my original description, "Hind tibiæ much thickened," etc., should read "Hind *femora* much thickened," etc.

A male sent me from the South African Museum has all the femora reddish on their basal two-thirds and the tibiæ the same, otherwise it appears identical with the above species; further material will decide whether *this* is a subform or a distinct species.

Laphria nigrescens, ♂ ♀, sp. n.

Type (male) and four other males.

Type (female) and four other females.

All from Mt. Mlanje, Nyasaland (*S. A. Neave*).

A dull black-coloured species with fine white pubescence on the legs. Moustache of long black bristles intermixed with some fine white hairs.

Length, ♂ 12–15, ♀ 12–14 mm.

Male.—*Face* greenish black, with a prominent tubercle on the lower part bearing the moustache of long weak black bristles and yellowish-white long fine hairs; upper part of face covered with yellowish-brown tomentum and with glistening yellowish recumbent hairs on each side, some upright hairs of much the same colour below the antennæ; the hairs at the sides vary in colour from yellow to white in the other males. *Palpi* black, with pale hairs. Beard white. *Antennæ* black, the first two joints with numerous black bristly hairs. Forehead with the same hairs at the sides. Hind part of head and collar with black bristles. *Thorax* shining, blackish, shoulders reddish, with a bunch of reddish-yellow bristles; pubescence on dorsum black but scanty and short, one weak white præsutural bristle, three or four weak postalar blackish bristles; there are traces of short yellowish pubescence on the posterior part of dorsum. *Scutellum* black, with short yellow hairs and very weak long yellowish ones on its posterior border. *Abdomen* dull black, with yellow bristles and white hairs at sides and on the underside. *Genitalia* large and protruding, the pincers shorter than the lower ones, both shining black, with long black bristly hairs. *Legs* black, the hind femora incrassate; pubescence on legs long, white; on the inner side of fore tibiæ it is short and thick, becoming orange-yellow at apex; some long black hairs are present on all the tarsi and on the outer side of the hind tibiæ at their apices; the bristles are black, long, but weak on the femora and tibiæ. *Wings* smoky grey, paler at base, the first posterior cell slightly narrower at border, small transverse vein on lower third of discal cell.

Female.—*Thorax* blue-black, with short yellow pubescence on the dorsum, the præsutural bristle black and very stout. *Abdomen* with grey tomentose triangular spots on the first four segments on the sides; these are faintly traced on the male but are much smaller, the borders of segments usually covered with white pubescence, also present on the sides. Hairs on face at sides glistening white.

This species is distinguished from *Laphria albimaculata*, Macq., by the dull black colour, not blue-black, and the white spots on the abdomen are very much less of a feature, being practically absent in the male.

Laphria aurifer, ♂, Hermann, *in litt.*, sp. n.

Paratypes (three males) from Toro, 4000–4500 ft., Daro or Durro Forest (two), and Unyora, Budongo Forest; Uganda Prot. (*Neave Coll.*).

Co-type (*Hermann*) (male) from Nyasaland (*Neave Coll.*).

A handsome black species with yellow-haired scutellum and yellow moustache, and yellow hairs on abdomen. Wings dark brown.

Length 19–23 mm.

Face bronze-green, tubercle large. *Moustache* composed of long weak golden-yellow hairs. *Palpi* yellow-haired. Beard same colour as moustache. Face above the tubercle with thick golden-yellow hairs at sides, some yellowish-grey tomentum in centre. *Antennæ* black, with some yellow hairs, the third joint wanting. Forehead black, with yellow hairs. Hind part of head with yellow hairs. *Thorax* and collar black, the former with short golden-yellow pubescence, longer at sides and on posterior border of thorax; these yellow hairs are long and very thick. *Scutellum* covered with them and with yellow bristles on border. *Abdomen* black, with golden-yellow hairs on the sides of the first four segments extending on the posterior borders, but not reaching the median line of dorsum. *Genitalia* black, with some long black hairs at apex, almost bristles ; underside of abdomen with long weak dark hairs. *Legs* black, shining, the fore legs with long yellow hairs, the middle ones with the same, not so thick but very long, hind pair with much fewer ; hind femora incrassate. *Wings* long, dark brown, pale at the extreme base.

This species is allied to *Laphria lateralis*, Fabr., and has the long, very noticeable hairs on the fore and middle legs.

Laphria carbonaria, ♂ ♀, Hermann, *in litt.*, sp. n.

Type (male) from N. Nyasaland (*Hermann*).

Paratype (male) from Toro, 4000–4500 ft., Daro or Durro Forest, Uganda Protectorate.

Type (female) from Chagwe, Mabira Forest, Uganda Protectorate, and another female from Mbarara Fort, Portal Road, Southern Toro (*S. A. Neave*).

A small black species with a shining smooth abdomen, reddish yellow at the base, black legs, and brown wings.

Length, ♂ 13, ♀ 12–13 mm.

Male.—*Face* black, covered with glistening golden-yellow tomentum. *Moustache* on the large blackish tubercle is composed of long black and yellow hairs. Beard golden-yellow. *Palpi* yellow-haired. *Antennæ* black, the third joint wanting, the first two with black hairs. Forehead shining black, with black hairs. Hind part of head with black hairs continued round head. *Thorax* and collar black, with traces of grey tomentum on the former, pubescence scanty, black shoulders with greyish-white tomentum, sides of thorax with the same, and with long black hairs and one black bristle. Breast-sides black, with grey tomentum and long fine black hairs. *Scutellum* black, with black hairs on its border. *Abdomen* sudan-brown on the first three segments, then black; dorsum devoid of pubescence; sides with yellow hairs at base. *Genitalia* complicated, contained in a black shining oval under piece ending in a blunt point with hairs, containing two small turned-up pincers, and above them three longer narrow processes on a black shining base, some black hairs below on the under-piece and at apex. *Legs* black, shining, with black hairs, very long on the middle tibiæ; on the fore and middle femora and fore tibiæ are long yellow hairs below; tarsi also with scattered black hairs, any bristles black, but very few are present. *Wings* uniformly deep brown.

Female identical. *Moustache* chiefly black. Beard very pale yellow and scanty. Pubescence on legs is very much less and shorter, hind tibiæ incrassate as in male. Third joint of antennæ wanting in both females.

This species and *Laphria aurifer* were both labelled by Prof. Hermann as *Dicranolaphria*, presumably to form a subgroup of *Laphria*, to which *Laphria lateralis, superbiens*, and *bipenicillata* would probably also belong.

XXVII.—*On new* Curculionidæ *from Brazil* (*Coleoptera*).

By Guy A. K. Marshall, C.M.G., D.Sc., F.R.S.

Subfamily Otiorrhynchinæ.

Hypsonotus rhombifer, sp. n.

♀. Head with sparse minute pale blue scales above and dense large white scales beneath; the rostrum rather thinly clothed with pale blue, light brown, and grey scales; the prothorax with dense white scales, mingled with pale brown ones, on the lower surface and the sides as high up as the middle of the eye, the upper margin of this white area being rather irregular and gently curved, and the dorsum thinly clothed with brown scales; the elytra dorsally dark brown, bearing in the middle a large common transverse rhombus of pale brown narrowly edged with white, its lateral angles being produced in the form of rather broad white transverse bands uniting with the pale lateral margin, and its anterior angle produced as a whitish sutural stripe, slightly widening to the base and there extending outwards on each elytron as far as stria 3; the apical declivity covered by a large pale brown patch, with its anterior margin edged with white, and enclosing a small dark brown spot quite close to the apex, this spot being also bordered with white anteriorly; the lateral margin is whitish at the base and emits a short white spur inwardly behind the shoulder as far as stria 6, but the two outer intervals soon turn into pale brown, though interval 9 remains whitish from the shoulder to the apical pale brown patch.

Head finely aciculate and with small shallow punctures on the vertex, with a very faint broad transverse depression between the vertex and forehead, the latter rather strongly punctate and with a very deep median furrow. *Rostrum* parallel-sided from the base to two-thirds, thence broadly dilated; the dorsum rather coarsely punctate, distinctly tricarinate, the median carina being much higher than the others. *Antennæ* with the two basal joints of the funicle equal. *Prothorax* very nearly as long as broad, subparallel-sided in the basal fourth, the sides then gently rounded, constricted near the apex, widest before the middle; the base feebly bisinuate, the apex narrower, slightly arcuate dorsally, with the postocular lobes prominent and broadly rounded; the dorsum almost flat in profile, gently sloping forwards, closely set with depressed but rounded granules, each bearing a recumbent scale-like brown seta; the brown scaling almost obsolete on the disk, denser laterally; the pleuræ with very small sparse squamigerous granules just showing through the dense white scaling. *Scutellum* with minute sparse pale blue scales. *Elytra* subovate, shallowly sinuate at the base, with the shoulders prominent, the sides parallel from there to the middle, then narrowing to the apex and there jointly rounded; the dorsal outline gently convex, highest about the middle, the posterior declivity forming a regular curve and not abruptly declivous; the punctures in the shallow striæ large and deep dorsally in the basal half, diminishing markedly behind and at the sides; the intervals narrow and rather uneven towards the base, broader and flatter behind, with irregular recumbent inconspicuous scale-like setæ. *Legs*: the front pair with pale blue scaling, the apical half of the femora and the dorsal edge of the tibiæ brown, the femora having a bare shiny longitudinal costa on the basal half both internally and externally; the posterior pairs of femora with light brown scaling and a large oblique white apical patch.

Length 9·5 mm., breadth 4 mm.

BRAZIL: Bahia (*G. Bondar*).

The adults are recorded as feeding on the leaves of cacao.

Readily recognisable by its very distinctive coloration. Its nearest ally, *H. selectus*, Jek., apart from its very different pattern, differs in having joint 2 of the funicle much longer than 1, the median carina of the rostrum is not markedly elevated, the prothorax is much broader than long, the setæ on the posterior half of the elytra are long, narrow, and suberect, etc.

Subfamily *ANTHONOMINÆ*.

Anthonomus pitangæ, sp. n.

♀. Integument red-brown, the head red-brown above, with fulvous scaling and a pale spot near each eye, mainly blackish below with white setiform scaling; the prothorax with a large patch of overlapping oblong fulvous scales on each side, the disk appearing darker because the fulvous scales are scattered and interspersed with narrow dark brown ones, there being a narrow median line of fulvous scales; the scutellum with dense, pale yellowish scales; the elytra red-brown, rather thinly clothed with small, narrow or setiform, pale yellowish and whitish scales, and varied with markings formed by dense erect fulvous and blackish scales: a short blackish oblique band from the scutellum to a small tubercle on interval 4, the band extending to the base on intervals 1 and 3, but not entirely on 2; a small basal blackish patch on interval 5, and numerous larger irregular patches behind the shoulder on intervals 5–10, which may be replaced by an oblique dark band extending from the margin to the middle of stria 1 and dilated on intervals 2–4; behind and adjoining this a band of dense pale yellowish and fulvous scales, which is wider and darker externally, and becomes narrower and paler inwardly, reaching stria 1; immediately behind this again a narrow dark band between striæ 1 and 8; the lower surface rather thinly clothed with narrow white scales, and with a patch of dense white scales in the upper angle of the mesepimeron only; the integument of the sternum mainly blackish, with the margins of the sternites* red-brown; the venter flavous, with a large fuscous patch in the middle of the three terminal ventrites.

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* The word "sternites" is here used in its strict sense as referring to the sclerites of the sternum, and *not* to those of the venter, for which the term ventrites is both more suitable and more accurate.

Head closely punctate, the scales much denser along the margins of the rather prominent eyes; the forehead with a low median carina terminating in a small deep fovea. *Rostrum* about twice as long as the pronotum, strongly curved, with four punctate striæ in the basal half, and scattered shallow punctures anteriorly. *Antennæ* with the joints of the club rather loose. *Prothorax* transverse, rounded at the sides, widest a little behind the middle, slightly narrowed thence to the base, very strongly narrowed and subtubulate in front; the dorsal outline feebly convex in the basal two-thirds, and sloping steeply in front; the dorsum with close, finely rugulose punctation throughout; the pleuræ with the scales elongate and setiform. *Elytra* gibbous, rather short and broad, much wider than the prothorax at the shoulders, which are broadly and subrectangularly rounded, slightly wider behind the middle, hardly dehiscent at the apex; the striæ narrow, with deep separated punctures, a broad oblique depression between striæ 1 and 4 at about one-third from the base; interval 2 with a small squamose elevation just before the middle, an elongate one just behind it, and a small one on the declivity; interval 3 with an elongate patch of erect scales behind the middle, and a similar one on interval 4, which has also a rounded squamose elevation at one-fourth from the base; the posterior callus obtusely prominent. *Legs* flavous, the front femora mostly brown or blackish, the edge of the very large, acute, triangular femoral tooth and the inner edge of the front tibiæ black; the middle femora with an indefinite dark patch on the clavate part; the posterior pairs of femora each with a much smaller triangular tooth; the front tibiæ deeply sinuate internally in the basal half and there bicarinate; the claws with a long tooth.

Length 3·6 mm., breadth 2 mm.

Brazil: Rio Grande do Sul, 2 ♀ ♀, xi. 1922 (*C. Ronna*).

The specimens were kindly sent by Dr. Carlos Moreira, with the information that the Weevils breed in the fruits of the "pitanga" (*Eugenia uniflora*), which are used for flavouring various kinds of confectionery.

The insect is closely related to *A. nigromaculatus*, Champ. (Biol. Cent.-Amer., Col. iv. pt. 4, p. 161, pl. ix. fig. 20), but that species lacks the frontal fovea; the scales on the prothorax are shorter and broader, not overlapping at the sides, and more evenly distributed, and those on the pleuræ are not setiform; the patch of white scales on the mesosternum is larger, extending on to the base of the mesepisternum ; the venter has no dark patch, etc.

Subfamily *Prionomerinæ.*

Prionomerus bondari, sp. n.

♂ ♀. Colour uniform testaceous-brown, thinly clothed with short subrecumbent pale hairs, which are longer, stouter, and whiter on the head, rostrum, and legs than on the pronotum and elytra.

Head with the hairs on the vertex transverse ; the forehead impunctate, as broad as the antennal club, shiny and bare, except for a stripe of dense hairs along the inner margin of each eye, and with a deep rounded median fovea. *Rostrum* nearly as long as the pronotum, stout, almost straight, and slightly widening from base to apex ; the basal half bare and impunctate in the middle, punctate and with numerous obliquely-recumbent white hairs at the sides ; the apical half bare and with very shallow isolated punctures, which are finer in the ♀. *Antennæ* with the scape curved at the base of the knob ; the funicle with joint 1 larger and much thicker than 2, the others transverse and gradually widening outwardly. *Prothorax* broader than long (3 : 2), widest at the base, slightly rounded at the sides, much narrowed anteriorly, and with a very shallow constriction near the apex ; the basal margin feebly bisinuate, the apex truncate dorsally ; the dorsum throughout with very shallow irregular punctures of unequal size, which become rather deeper and subconfluent at the sides, and with thin pale pubescence. *Scutellum* oblong-ovate, nearly twice as long as broad. *Elytra* very broadly ovate, nearly as broad as long (9 : 10), not explanate laterally behind, the shoulders produced laterally into an obtuse angle, the sides rounded from the basal angle to the tip of the shoulder, gently sinuate behind the shoulder, then slightly dilated again behind the middle, and very broadly rounded at the apex ; the dorsal outline very convex, deepest a little before the middle, and the anterior slope just as steep as the posterior one ; interval 3 with an obtuse prominence on the highest part, which causes the striæ to curve away on each side of it ; the striæ rather deep and distinctly punctate ; the intervals broad, smooth, and impunctate, thinly clothed with short subrecumbent hairs ; the posterior callus low and obtuse. *Legs* short, testaceous-brown, with sparse recumbent white setæ ; the tooth of the front femora with its anterior edge straight, the outer denticle being contiguous to and not much larger than the others; the front tibiæ finely serrate and setose on the inner edge from the base to the middle.

Length 4 mm., breadth 2·5 mm.

BRAZIL: Bahia (*G. Bondar*, *Reed*—type); Para.

Dr. Bondar states that the adults feed on the leaves of the African oil-palm (*Elæis guineensis*). Described from eleven specimens.

Of the other species in which the elytra are not laterally explanate behind, *P. bigibbosus*, Boh., is the only one having a discal prominence on each elytron, but this Mexican species can be distinguished by the fact that it is black in colour, and has the elytral prominences on interval 4, instead of on 3.

Subfamily *CRYPTORRHYNCHINÆ*.

Collabismodes tabaci, sp. n.

♂. Integument black or piceous; the head with dingy grey scaling and two large subcontiguous patches of black scales in the middle; the prothorax rather thinly clothed with dingy grey scales, with four clusters of erect cylindrical black scales, two at the apex and two in the middle of the disk, and similar scattered erect black and white scales at the sides; the elytra very densely clothed with golden-brown scales, which become lighter on the disk and darker towards the sides, interval 1 from the base to the middle, and a very ill-defined large area behind each shoulder markedly paler, a very indefinite dark brown stripe on interval 2 from the base to one-third, a very irregular ill-defined common transverse black marking behind the middle and extending to about stria 3 on each elytron, and the whole of the posterior declivity occupied by a very large, suboblong, creamy-white or pale buff patch, the edges of which are sharply defined and extend laterally beyond the posterior callus; on the transverse black marking and for some distance in front of it and behind it are numerous very broad erect black and whitish scales.

Head with deep reticulate punctures throughout, partly concealed by the flat grey scales; the black scales more or less raised, and a row of erect pale and black scales along the margins of the eyes. *Rostrum* stout, rather strongly curved, rapidly narrowing from the base to the insertion of the antennæ (well behind the middle), then gradually widening to the apex, which is about as broad as the base;

the basal third with coarse shallow punctation and sparse erect scales, but without any median carina; the apical portion shining and with scattered strong punctures. *Antennæ* testaceous; the two basal joints of the funicle subequal, the basal joint of the club shorter than the rest together. *Prothorax* very nearly as long as broad, moderately rounded at the sides, broadest behind the middle, much more narrowed in front and shallowly constricted at the apex; the base gently bisinuate, the apex strongly arcuate dorsally; the dorsum closely and strongly punctate throughout, without any median furrow or carina, the apical third being shallowly depressed below the level of the disk; the grey scales somewhat asymmetrically placed in the punctures and slightly concave. *Elytra* feebly rounded separately at the base, widest at the roundly rectangular shoulders, very gradually narrowed posteriorly, and rather broadly rounded behind, the actual apex being subtruncate; the dorsal outline gently convex, highest before the middle, the posterior declivity almost perpendicular, the apex produced downwards, as seen from the side; the dorsum so densely clothed with ovate imbricated scales that all the striæ are completely obliterated, though their positions are indicated by the regular rows of recumbent scales arising from the punctures, which are not easily distinguishable from the general clothing; intervals 2 and 4 in the basal half and intervals 6 and 8 throughout with a single widely-spaced row of narrowed flattened erect setæ (mostly dark), but in a common area between the middle and the top of the declivity the setæ are replaced by numerous broad erect fan-like scales, those on the dark areas being usually black and the others whitish. *Legs* with pale scaling variegated with dark patches and with erect scale-like pale setæ.

Length 3·9–4 mm., breadth 1·8 mm.

BRAZIL: Bahia (*G. Bondar*).

Described from three specimens bred from stems of tobacco.

The genus *Collabismodes*, Champ. (1905), as originally constituted, was monotypic, containing only a common Central-American species, *C. gamma*, Champ., but an examination of the four species referred by Champion (Biol. Cent.-Amer., Col. iv. pt. 4, pp. 494, 495) to the genus *Euxenus*, Fst.—namely, *E. apicalis*, Fst., *E. subparallelus*, Champ., *E. ovatipennis*, Champ., and *E. rhombifer*, Champ.,—shows that they must all be referred to *Collabismodes*. Faust describes his genus (Stett. ent. Ztg. 1896, pp. 47, 50) as having the tarsal claws free and the forehead as broad as the rostrum; whereas in the species mentioned the claws are connate at the base and the forehead much narrower than the rostrum.

I have not seen *Euxenus posticus*, Fst., which Champion cites as the genotype of *Euxenus*, and am therefore unable to say whether Faust's description of the forehead and claws properly applies to it. I suspect, however, that this species will also prove to be inseparable from *Collabismodes*, and for this reason I refrain from suggesting a new name for *Euxenus*, Fst. (1896), which is preoccupied in Anthribidæ by *Euxenus*, Leconte (1876). *Collabismus cluniferus*, Boh., must also be transferred to *Collabismodes*.

Metoposoma porosum, sp. n.

♀. Integument dull black; the head, rostrum, and prothorax bare, except for erect scale-like setæ in the punctures on the forehead and prothorax; the elytra with dense cinnamon-brown scaling, with a common darker patch, shaped like an hour-glass, from the base to the top of the declivity, extending laterally at the base to stria 4, at its narrowest to stria 2, and posteriorly to stria 3, interval 1 being almost bare from the base to the middle; the external margin bare throughout, and stria 9 also from the base to beyond the middle; a large irregular black patch below the shoulder, a large suboblong patch of dense black scales from behind the posterior callus to the apical margin, and a small common transverse patch at the actual apex; the lower surface dull black with large, scale-like, yellowish setæ in the punctures on the sternum and along the sides of the venter.

Head convex, very coarsely punctate, and with a supraocular furrow; the frontal foveæ large, oval, and very deep. *Rostrum* stout, strongly curved, parallel-sided from the base to the middle, then gradually widening to the apex; the dorsum convex and smooth, with two very irregular rows of punctures on each side, and a deep, coarsely punctate furrow above the scrobe. *Prothorax* transverse (6 : 5), rather strongly rounded at the sides, widest a little behind the middle, and not constricted at the apex; the base bisinuate, the apex much narrower, arcuate dorsally; the dorsal outline strongly convex, highest a little before the middle, and sloping much more steeply in front than behind; deeply scrobiculate throughout, the uneven intervals finely shagreened and impunctate, with a very sinuous low median costa from the base to two-thirds; the squamiform setæ mostly dark, but on each side on a line with stria 3 a duplicated row of much broader pale setæ from the base to the middle. *Scutellum* obovate, densely covered with overlapping pale scales. *Elytra* oblong-ovate, separately rounded at the base, roundly rectangular at the shoulders, parallel-sided for only a short distance behind them, then gradually narrowing behind, the actual apices jointly rounded, but with a transverse juxta-apical callus on each side covered with erect scales; the punctures on the dark discal area very large and deep, each containing a horizontal scale, those in the pale areas much smaller and completely hidden by the scaling, without any sign of striation, except the two external striæ, which do not coalesce, as they do in the genotype, *M. funebre*, Boh.; the intervals bearing a single row of broadly spatulate, erect, scale-like setæ, which are either dark brown or whitish and very unequally spaced in the rows. *Legs* with dense cinnamon scaling, with a broad blackish ring near the base of each tibia; the femora without a tooth. *Venter*: the three intermediate ventrites each with a single transverse row of small punctures.

Length 9–9·6 mm., breadth 4·2–4·5 mm.

BRAZIL: Bahia (*G. Bondar*).

Described from three specimens bred from the trunk of an unidentified leguminous tree.

M. funebre, Boh., is very similar to the present species in general facies and structure, but in addition to its smaller size and very distinctive coloration it differs as follows:—the prothorax lacks the median costa and the punctures are much smaller; the scutellum is bare and transversely ovate; the elytra lack the large deep punctures (except in the basal half of stria 1), interval 3 bears a small elevation near the base and another behind the middle, the posterior callus is much reduced; the femora bear a small obtuse tooth; the punctures on the venter are large and deep, ventrite 2 (1) bears three transverse rows, etc.

Cœlosternus manihoti, sp. n.

♂ ♀. Integument black, rather thinly clothed with brown scales, irregularly variegated with small groups of white and blackish scales; the pronotum with a large longitudinal median patch of whitish scales on the basal half; each elytron with a smaller patch of smaller whitish scales at the base next the scutellum, and another near the apex just behind the posterior callus, and a small patch of black scales at one-fourth from the base on interval 4.

Head with deep reticulate punctation and sparse pale scales; the forehead very nearly as broad as the rostrum at the insertion of the antennæ, with a deep median fovea. *Rostrum* rather dull, almost bare, with coarse, longitudinally confluent punctation and an obtuse median carina in the basal half, and with small separated punctures in the apical half which are appreciably finer in the ♀. *Antennæ* inserted just a little behind the middle in both sexes, red-brown; the scape rather strongly curved, impunctate, with a few minute recumbent setæ; joint 1 of the funicle as long as but broader than 2, the remainder gradually diminishing in length, 5 as long as broad, 7 distinctly transverse; the club longer than the preceding five joints. *Prothorax* somewhat broader than long, slightly widening from the base to near the middle, thence rapidly narrowed to the apex, which is truncate dorsally and one-half the width of the base; the basal margin bisinuate and with a narrow margin for the reception of the base of the elytra; the dorsum strongly convex in both directions, with coarse reticulate punctation and with an obtuse shiny median carina, which is prominent only in the middle and gradually disappears in front and behind; the pale median patch is formed of very broad overlapping scales, and on each side and in front of it is a wide area bearing narrower isolated dark brown scales, the exposed portions of the integument being shiny; the pleuræ densely covered with large overlapping buff scales. *Scutellum* very much smaller than the cavity containing it, ovate, convex, bare, and with a variable transverse impression near the apex. *Elytra* widest behind the shoulders, which are moderately prominent and rounded, gradually narrowing thence posteriorly, and with a deep ante-apical constriction; the striæ with deep separated punctures, each containing a small oblong scale, and becoming obsolete near the apex; intervals 3, 5, 7, 9, and the apical half of 1 sharply carinate throughout, the others flat, and the basal half of interval 1 bearing a row of separated granules in the ♂ only; the scales much smaller than those on the pronotum, ovate, without evident setæ. *Legs* mottled with pale scales and with a denser band near the apex of the femora, which bear shallow rugulose punctures, the front pair having two small projecting teeth, and the posterior pairs only a single obtuse one; the tibiæ all sharply carinate on the dorsal edge, the front pair broader than the others, more strongly curved on the dorsal edge, with the inner edge bisinuate, the apical sinuation being minutely denticulate in the ♂ only; the front tarsi with much longer hairs in the ♂ than in the ♀.

Length 6·6–7·8 mm., breadth 3·3–3·9 mm.

BRAZIL: Bahia, 6 ♂♂, 3 ♀♀ (*G. Bondar*). WEST AFRICA: San Thomé Isl., 1 ♂ (*H. J. Snell*).

The larvæ of this insect bore in the stems of manioc (*Manihot utilissima*).

This species is nearly related to *C. granicollis*, Pierce (1916), which attacks the same plant. But the latter insect differs, *inter alia*, in its much more shiny and sparsely punctate rostrum; the pronotum is covered with large overlapping scales throughout and bears sparse suberect setæ, and the median carina is very sharp and continued right to the apex; the basal margin of the elytra is more prominent on each side of the scutellum, and the carinæ are much sharper, especially that on interval 3; and the posterior pairs of femora have a much sharper tooth and an additional small one.

The insect has evidently been introduced comparatively recently into San Thomé, whence we have received several other South-American Coleoptera.

Cœlosternus cariniceps, sp. n.

♂ ♀. Integument black, with rather dense light brown or brownish-grey scales, variegated with cream-coloured or greyish-white markings; the pronotum brown, with a large indefinite median creamy patch on the basal half; the flat intervals on the elytra light brown or brownish grey, with a small, but rather conspicuous, blackish patch at one-fourth from the base on interval 4, and a few indefinite small dark markings elsewhere; the carinate intervals mottled with irregularly alternating light and dark patches.

Head with a strong curved shiny sinuous transverse ridge not far behind the eyes, the area behind it somewhat flattened and rugosely punctate, the interspaces being subgranulate; the forehead half as wide as the rostrum near its base, very coarsely punctate and with a distinct median furrow. *Rostrum* as in *C. manihoti*, sp. n., except that the median carina is much more prominent. *Antennæ* also as in *manihoti*, but the club about as long as the six preceding joints. *Prothorax* very like that of *manihoti*, but the median carina high and sharp, reaching the front but disappearing near the base, and the disk bearing scattered granules across the middle; the scales almost equally large and dense throughout, the granules bearing subrecumbent spatulate brown setæ. *Scutellum* pear-shaped, elongate, bare, longer than that of *manihoti*. *Elytra* more triangular than in *manihoti*, being rather wider at the shoulders and rather more narrowed behind; the carinæ somewhat sharper, and interval 8 with a very short low carina at the base (confined to the humeral prominence); interval 1 with a row of distinct granules on the basal half in the ♀ as well as the ♂; the scale contained in the punctures much narrower, linear. *Legs*: a second tooth present on the front femora, feeble or absent on the posterior pairs; the front tibiæ bisinuate internally, the apical sinuation not denticulate in either sex.

Length 8·7–9·6 mm., breadth 4·2–4·5 mm.

BRAZIL: Bahia, 4 ♂ ♂, 4 ♀ ♀ (*Reed*).

Superficially much resembling *C. compernis*, Germ., but in that species the forehead is very narrow; the rostrum is much more slender and finely punctate, the scales on the disk of the pronotum are narrowly separated, and the median carina reaches the base, the carina on interval 8 of the elytra is longer, extending to one-fourth from the base, etc.

Cœlosternus notaticeps, sp. n.

♂ ♀. Head with rather sparse brown scaling and a large yellowish-white patch on each side adjoining the eye; the prothorax with dense brown scaling and usually with a rather indefinite, large, paler, diamond-shaped patch in the middle; the elytra with the flat intervals light brown, varying somewhat in tint, interval 4 with a small black patch at one-third from the base, and the carinate intervals variegated with brown, creamy-white, and a few black scales.

Head coarsely but shallowly punctate, without any transverse carina, the surface mostly finely shagreened, but some of the higher intervals between the punctures shiny; the scattered scales a good deal broader than those of the two preceding species, and the scales in the pale patches much larger still; the forehead hardly as broad as the club of the antennæ, with the median carina of the rostrum faintly continued on it. *Rostrum* relatively rather stouter and shorter than in *C. soleatus*, Germ., and *C. compernis*, Germ. (the sternal furrow not reaching the hind margin of the median coxæ, as it does in those species), with coarse shallow shagreened punctures and a sharp median carina on the basal half, the spaced punctures on the apical half somewhat stronger in the ♂ than in the ♀. *Antennæ* with joint 1 of the funicle much longer than 2, 5 as long as broad; the club as long as the funicle. *Prothorax* much broader than long, subparallel-sided from the base to one-third, then roundly narrowed to the apex: the dorsum with rather shallow close punctation, all the intervals being dull and shagreened, and with a prominent median carina that reaches the apex but entirely disappears behind the middle; across the middle is a transverse row of four small groups of low granules; the broad scales for the most part concealing the integument, and with a few scattered broad spatulate suberect setæ. *Elytra* very similar to those of *C. compernis*, but proportionately shorter, with the carinæ slightly lower, without any basal carina on interval 8, and with the punctures distinctly larger and each containing a subcircular or broadly ovate scale; interval 1 without granules in either sex. *Legs* with almost uniform, pale brown scaling; the femora all bidentate; the front tibiæ markedly bisinuate internally, and not denticulate in the ♂; the front tarsi of the ♂ without the usual longer hairs. *Venter* finely shagreened as in *soleatus*, and not shiny as in *compernis*, much more sparsely punctate in the middle than usual; the basal ventrite rather more closely punctate in the ♂ than in the ♀.

Length 7·5–8·5 mm., breadth 4–4·5 mm.

Brazil: Bahia, 2 ♂ ♂, 3 ♀ ♀ (*G. Bondar*).

Bred from the stems of undetermined Euphorbiaceous plants.

The short second funicular joint of the antennæ is an unusual character in the *compernis* group, as is also the absence of the fringe on the front tarsi of the ♂, though the latter character is but little developed in *granicollis*, Pierce.

The following key may serve to discriminate the three species here described from some of their nearer allies; but it must be noted that *C. loripes*, Boh., and *C. clieutellus*, Fst., are known to me from description only:—

1 (14). Eyes approximate; the forehead not or but slightly broader than the antennal club.

2 (3). Elytra with the carina on interval 3 broadly, that on interval 5 narrowly interrupted not far from the base; the carina on interval 3 thickened and elevated at the apex .... *soleatus*, Germ. [(1824).

3 (2). Elytra with the carinæ on intervals 3 and 5 not interrupted, that on interval 3 not elevated at the apex.

4 (11). Head with a transverse arcuate or angulate carina behind the eyes.

5 (6). Interval 6 on the elytra with a short sharp carina at the apex only; the pectoral

furrow densely clothed with finely feathered scales; interval 1 on the elytra without granules in either sex; scales in the middle of the metasternum long and setiform .... *tardipes*, Boh. [(1837).

6 (5). Interval 6 without any carina at the apex; the pectoral furrow bare.

7 (8). Joints of the funicle with the clavate portion dull and shagreened; the club about as long as or longer than the funicle; scales in the middle of the metasternum long and narrow; interval 8 on the elytra with an abbreviated basal carina .... *compernis*, Germ. [(1824)

8 (7). Joints of the funicle smooth and shiny; the club much shorter than the funicle; scales in the middle of the metasternum subcircular or very broad; interval 8 without a basal carina.

9 (10). Scales on the pronotum flat, entirely concealing the punctures as well as nearly all the interspaces (except the scattered granules); the forehead much wider than the apex of the scape .... *granicollis*, Pierce [(1916).

10 (9). Scales on the pronotum somewhat concave, obliquely implanted in the deep punctures, the interspaces between which are not hidden, being narrow, shiny, and unevenly elevated; the forehead not wider than the apex of the scape .... *molestus*, Fst. [(1896).

11 (1). Head without any transverse carina.

12 (13). Pronotum without granules, its apical margin broadly but shallowly sinuate; the antennal club shorter than the funicle; the hind tibiæ broader than usual .... *loripes*, Boh. [(1844).

13 (12). Pronotum with a transverse row of four small groups of granules across the middle, its apical margin gently arcuate dorsally; the antennal club as long as the funicle, joint 2 of the latter much shorter than 1; the hind tibiæ normal.. *notaticeps*, sp. n.

14 (1). Forehead much broader than the antennal club.

(16). Forehead as broad as the rostrum, which is scarcely dilated at the base; the prothorax widest at the base and slightly narrowed to the middle, not granulate on the disk, and the intervals between the punctures covered by the dense scaling; head without a transverse carina .... *clientellus*, Fst. [(1896).

16 (15). Forehead much narrower than the rostrum, which is distinctly widened at the base; the prothorax slightly widening from the base to near the middle, the intervals between the punctures granulate

on part of the disk or more or less visible between the scales.

17 (18). Head without a transverse carina; the pronotum scarcely granulate on the disk, the median carina low and obtuse; interval 8 on the elytra not carinate at the base, scales in the middle of the metasternum narrow . . . . *manihoti*, sp. n.

18 (17). Head with a prominent curved transverse carina; the pronotum distinctly granulate, the median carina sharp.

19 (20). Scales in the middle of the metasternum very narrow, setiform; the elytra with a very short carina at the base of interval 8; the forehead with a broad median furrow; length 8·5–10 mm. . . . . *carinuceps*, sp. n.

20 (19). Scales in the middle of the metasternum very broad or subcircular; the elytra without any basal carina on interval 8, the forehead not sulcate; length 5·5–7 mm. . . . . *granulicollis*, Pierce (1916).

XXVIII.—*Variation of the Lepidosis of a Snake from S.E. Asia.* By H. W. Parker, B.A.

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In 1913 Ruthven[*] urged the desirability of stating the *average* formula for the dorsal lepidosis of snakes. Unfortunately, when the material available is limited, a satisfactory average cannot be found, and, in consequence, specimens of the same species from a different locality and with a different scale-formula have been described as new. The variation in the dorsal scale-rows of *Natrix nuchalis* (Boulenger) described below illustrates the range of variation in one species.

Ten specimens of this species were obtained from Ngoi Tio, Tonkin. They agree with Boulenger's original description, but possess 17 scale-rows anteriorly, reducing to 15 in front of the vent. This is the condition found in a specimen from Sinlum Kaba, Upper Burma, described as *Natrix leonardi* by Wall[†]. In addition, Colonel Wall has recently presented to the British Museum another specimen from the same locality, which he refers with some doubt to

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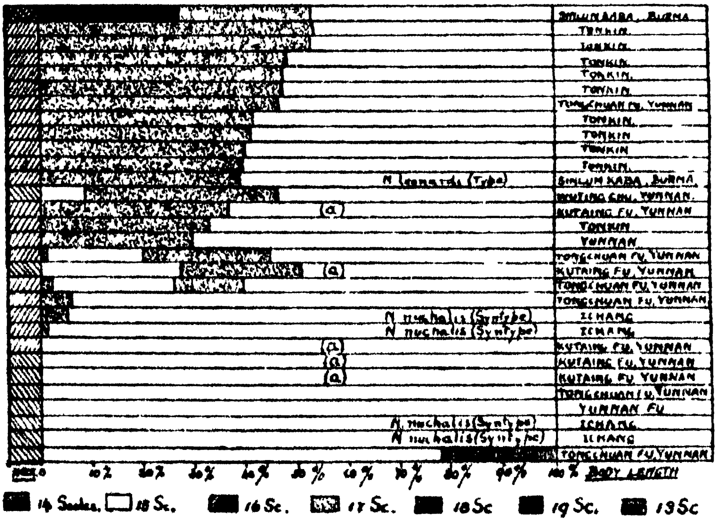
[*] Ruthven, 'Science,' New York, xxxvii. 1913, p. 60.

[†] Wall, Journ. Bombay Nat. Hist. Soc. 1923, p. 466.

N. leonardi, pointing out that it possesses 19 scale-rows anteriorly, reducing through 17 to 15 before the vent.

In these snakes the number of scale-rows round the neck is even; a median dorsal row arises from the nuchal sulcus making the number of rows odd over the remainder of the body; any further increase or decrease in the number of rows is brought about by the insertion or dropping of a lateral row on each side. In the accompanying diagram the condition of the lepidosis is indicated pictorially for a number of snakes, the length over which 13, 15, 17, and 19 scale-rows persist being calculated as a percentage of the total length of the body. Where the insertion or dropping of the lateral row is not coincident on the two sides, the length is calculated from the anterior increase to the posterior reduction.



From the diagram it will be seen that there is a complete gradational series between forms having 14 rows on the neck, increasing to 15 and reducing to 13, and forms with 18 on the neck, increasing to 19 and reducing through 17 to 15. The increase from 15 to 17 rows on the mid-body may be brought about by the insertion of lateral rows on the neck which persist on to the body, lateral rows on the body which do not reach the neck, or lateral rows on both neck and body. Expressed as formulæ (an additional term being added to show the condition at the nuchal sulcus), the following conditions are present:—14 : 15 : 15 : 13, 14 : 15 :

15 : 15, 14 : 15 : 17 : 15, 16 : 17 : 15 : 15, 16 : 17 : 17 : 15, and 18 : 19 : 19 : 15. In one specimen, where the lateral rows on the neck are dropped exactly where the mid-dorsal row commences, the formula is 16 : 15 : 15 : 15. Two of the types of *N. nuchalis* show the same condition as is found in a more pronounced state in the type of *N. leonardi*, and the five specimens marked (*a*) from Kutaing Fu (of which three are young and probably belonging to the same brood) show four different conditions. The conclusion is that *N. nuchalis* and *N. leonardi* are synonymous, and that the dorsal lepidosis can only be defined by two formulæ—a maximum and a minimum. These, so far as is at present known, are max. 18 : 19 : 19 : 15 and min. 14 : 15 : 15 : 13.

The condition of an even number of scales round the neck is not confined to *nuchalis* in the genus *Natrix*, but is also found in the closely allied species *N. swinhonis* (Günth.) from Formosa. Here the nuchal sulcus is rudimentary, and has hitherto been overlooked. On the nape the two dorsal rows of scales are slightly enlarged and arranged in pairs for a short distance, the suture between the members of each pair being perfectly straight and continuous with the suture in front and behind it. At the hind end of this rudimentary sulcus the mid-dorsal scale-row commences. The lepidosis in the five specimens examined is 14 : 15 : 15 : 15, or 16 : 15 : 15 : 15 where a lateral scale-row on the neck is dropped at the same point at which the dorsal row commences.

XXIX.—*Notes on Lizards from the South Pacific Islands.*

By H. W. Parker, B.A.

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During the examination of a large number of lizards, apparently of the species *Lygosoma cyanurum* (Lesson), which were collected in the New Hebrides by Mr. J. R. Baker, it was noticed that the number of subdigital lamellæ under the fourth toe was frequently greater or less than the number assigned to that species. An examination of all the specimens in the British Museum seems to show that two distinct species with overlapping areas of distribution have hitherto been confused under this one name. These two species are :—

(1) *Lygosoma* (*Emoa*) *cyanurum.*

Scincus cyanurus, Lesson, Voy. 'Coquille,' Zool. ii. p. 49, pl. iv. fig. 2.
Eumeces lessonii (part.), Dum. & Bibr. v. p. 654.
Mabouya cyanura (part.), Gray, Cat. Liz. B.M. 1845, p. 96.
Emoa cyanura, Girard, U.S. Expl. Exped., Herp. p. 270.
Mabuia baudinii (non D. & B.), Günther, Proc. Zool. Soc. 1874, p. 296.
Lygosoma cyanurum (part.), Bouleng. Cat. Liz. B.M. 1887, iii. p. 290.
Lygosoma impar, Werner, Zool. Anz. 1898, p. 553.
Lygosoma cyanurum, var. *schauinslandi*, Werner, Zool. Jahrb. Syst. xiv. 1901, p. 384.
? *Lygosoma cyanurum*, var. *werneri*, Vogt. Sitzungsber. Ges. naturf. Freunde, Berlin, 1912, No. 1, p. 5.

Scales in 24–30 rows round the middle of the body; subdigital lamellæ 56–76 under the fourth toe. In a small percentage of specimens the light vertebral stripe lies on a single row of scales as described by Werner for *Lygosoma impar*. Other characters as in Boulenger's description. One hundred and eighty specimens have been examined, with a range from the Trobriand and Admiralty Islands eastwards to Pitcairn Island and northwards to Hawaii.

(2) *Lygosoma* (*Emoa*) *lessoni.*

Tiliqua cyanura, Gray, Ann. Nat. Hist. ii. 1838, p. 289.
Eumeces lessonii (part.), Dum. & Bibr. v. p. 654.
Mabouya cyanura (part.), Gray, Cat. Liz. B.M. 1845, p. 96.
Euprepes cyanurus, Steind. Novara Rept. p. 44.
Euprepes kordoanus, Meyer, Mon. Berl. Acad. 1874, p. 133.
Euprepes (*Mabuya*) *beccarii*, Doria, Ann. Mus. Genova, vi. 1874, p. 338, pl. xi. fig. D.
Euprepes (*Mabuya*) *cyanurus*, Doria, *loc. cit.* p. 338.
Lygosoma cyanurum (part.), Bouleng. Cat. Liz. B.M. 1887, iii. p. 290.

Scales in 26–34 rows round the middle of the body; subdigital lamellæ 33–45 under the fourth toe; other characters as in Boulenger's description. Eighty-two specimens have been examined, with a range from Celebes through the Moluccas, New Guinea, Admiralty and Solomon Islands to the New Hebrides.

In specimens from the same locality the number of longitudinal tubules running towards the posterior margin of the osteoderms is higher, on an average, in *L. cyanurum* than in *L. lessoni*. This character, correlated with the lesser number of scale-rows and correspondingly larger scales of *L. cyanurum*, is of no diagnostic value, but serves to emphasise the distinctness of the two species. The subdigital lamellæ are structurally alike in the two species, and, under the distal phalanges, similar in size; proximally, however, those of *L. cyanurum* become very narrow and almost blade-like. In counting the lamellæ, those on the sole of the foot are included, from the point at which they attain the same width as those beneath the toe.

Names have been placed in the synonymy of one species or the other according to the locality from which the original specimens were obtained. Lesson's specimens from Tahiti are outside the range of the western form. Duméril and Bibron's specimens, from the "Oceanic Islands," probably belonged to both species, but their name is here restricted to the western one.

L. cyanurum, var. *werneri*, Vogt, is included under *L. cyanurum* with some doubt, as no specimens from the Mariana Islands have been examined.

XXX.—*A Collection of Reptiles and Batrachians from Tonkin.*

By H. W. PARKER, B.A.

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THE collection described below was made, under the direction of the Trustees of the Percy Sladen Trust and Godman Exploration Fund, by Mr. Herbert Stevens in the basin of the Red River. It is of interest because the known geographical range of several species is considerably extended and the faunistic relationships of the different areas are unusual. The individual specimens, also, are sometimes of interest. The specimens were collected in three localities: Bao-Ha and Thai-Nien in the low-lying ground of the river basin, and Ngoi Tio on the Col des Nuages at an altitude of from 4500 to 6500 feet.

The following is a list of the species collected in each locality, and for each species its distribution through the countries immediately surrounding Tonkin is indicated. Records from the island of Hainan have been included under the head of S. China:—

Bao-Ha (250 ft.).

LACERTILIA.

1. *Hemidactylus frenatus*, Dum. & Bibr.

S. China, Siam, Burma, Assam, and Annam.

2. *Mabuia siamensis* (Günth.).
S. China, Siam.

3. *Mabuia multifasciata* (Kuhl).
S. China, Siam, Burma, Assam, and Annam.

OPHIDIA.

4. *Natrix subminiatus* (Schleg.).
S. China, Siam, Burma, Assam, and Annam.

5. *Zamenis korros* (Schleg.).
S. China, Siam, Burma, Assam, and Annam.

6. *Coluber radiatus*, Schleg.
S. China, Siam, Burma, Assam, and Annam.

7. *Coluber prasinus*, Blyth.
S. China, Siam, Burma, and Assam.

8. *Dryophis prasinus*, Boie.
Siam, Burma, Assam, and Annam.

9. *Bungarus fasciatus* (Schneid.).
S. China, Siam, Burma, Assam, and Annam.

BATRACHIA.

10. *Rana macrodon*, Dum. & Bibr.
Siam and Annam.

11. *Microhyla pulchra* (Hallow).
S. China and Siam.

12. *Bufo melanostictus*, Schneid.
S. China, Siam, Burma, Assam, and Annam.

Thai-Nien (300 ft.).

LACERTILIA.

13. *Acanthosaura lamnidentata*, Bouleng.

S. China, Siam, and Annam.

Two specimens were obtained, and in both the single large scale which covers the tympanic area in this genus is broken up into smaller scales, the largest of which is not larger than one of the supraoculars. In this respect the specimens approach the genus *Japalura*, Gray, but in other respects are quite normal.

14. *Calotes emma*, Gray.

S. China, Siam, and Assam.

15. *Physignathus mentager* (Günth.).

S. China and Siam.

16. *Mabuia siamensis* (Günth.).

S. China and Siam.

17. *Mabuia multifasciata* (Kuhl).

S. China, Siam, Burma, Assam, and Annam.

OPHIDIA.

18. *Python molurus* (Linn.).

S. China and Assam.

19. *Natrix percarinatus* (Bouleng.).

S. China.

20. *Natrix stolatus* (Linn.).

S. China, Siam, Assam, and Annam.

21. *Natrix subminiatus* (Schleg.).

S. China, Siam, Burma, Assam, and Annam.

22. *Zamenis moi*, M. Smith.

Annam.

This species has hitherto been known from a single specimen. The present one differs from the type in the following respects :—Upper labials 5 and 6, and lower labials 6 and 7 fused on both sides. Ventral shields 170 ; subcaudals 96.

23. *Zamenis korros* (Schleg.).

S. China, Siam, Burma, Assam, and Annam.

24 *Dendrophis pictus* (Gmel.).

S. China, Siam, Burma, Assam, and Annam

25. *Calamaria septentrionalis*, Bouleng.

S. China.

26. *Hypsirhina plumbea* (Boie).

S. China, Siam, Burma, Assam, and Annam.

27. *Dipsadomorphus multimaculatus* (Boie).

S. China, Siam, Burma, Assam, and Annam.

28. *Dryophis prasinus*, Boie.

Siam, Burma, and Assam.

BATRACHIA.

29. *Rana tigrina pantherina* (Fitz.).

S. China, Siam, and Burma.

30. *Rana limborgii*, Sclater.

Siam.

31. *Rana limnocharis*, Wiegm.

S. China, Siam, Burma, Assam, and Annam.

32. *Rana guentheri*, Bouleng.

S. China and Annam.

33. *Rana erythræa* (Schleg.).
S. China, Siam, and Annam.

34. *Rhacophorus leucomystax* (Gravenh.).
S. China, Siam, Burma, Assam, and Annam.

35. *Microhyla ornata* (Dum. & Bibr.).
S. China, Siam, Burma, Assam, and Annam.

36. *Microhyla pulchra* (Hallow).
S. China and Siam.

37. *Bufo melanostictus*, Schneid.
S. China, Siam, Burma, Assam, and Annam.

Col des Nuages, Ngoi-Tio (4500–6500 ft.).

LACERTILIA.

38. *Acanthosaura lamnidentata*, Bouleng.
S. China, Siam, and Annam.

OPHIDIA.

39. *Natrix nuchalis* (Bouleng.).
S. China and Burma.

40. *Natrix percarinatus* (Bouleng.).
S. China.

The ten specimens in this collection agree with the type, except that occasionally four (instead of three) postoculars are present in addition to the small subocular. Ventrals 139–147; subcaudals 72–84.

41. *Pseudoxenodon macrops* (Blyth).
S. China, Siam, Burma, Assam, and Annam.

42. *Coluber mandarinus*, Cantor.
S. China.

43. *Coluber tæniurus* (Cope).

S. China, Siam, Assam, and Annam.

44. *Coluber frenatus* (Gray).

This species had hitherto only been recorded from the Khasi Hills, Assam. The present male specimen agrees in all respects with the types (females) except in the higher number of subcaudal shields and its larger size. Ventrals 205; subcaudals 115. Total length 141 cm.; tail 46 cm.

45. *Amblycephalus hamptoni*, Bouleng.

Hitherto only known from a single specimen from Mogok, Upper Burma. The present specimen is a mature female and differs appreciably from the type, but does not appear to be specifically distinct. Temporals 2 + 3 (instead of 1 + 2) and first pair of lower labials in contact behind the symphysial. Ventrals 195; subcaudals 96.

BATRACHIA.

46. *Rana limnocharis*, Wiegm.

S. China, Siam, Burma, Assam, and Annam.

47. *Rana andersoni*, Bouleng.

S. China.

48. *Rhacophorus leucomystax* (Gravenh.).

S. China, Siam, Burma, Assam, and Annam.

49. *Bufo melanostictus*, Schneid.

S. China, Siam, Burma, Assam, and Annam.

50. *Hyla annectens* (Jerdon).

S. China and Assam.

As may be expected from its geographical situation, the fauna is essentially Chinese; thirty-two of the thirty-eight species in this collection have previously been recorded from China. There is, however, an appreciable difference between the faunistic relationships of the high and low ground. Eighty-four per cent. of the species found only in the low ground are known from Siam, whereas only twenty-five per cent. of those from the high ground occur there. The following table summarises the distribution of the species from the two areas:—

	Spp. confined to low ground.	Spp. confined to high ground.
Total number collected	25	8
Spp known from China	23=92 %.	5=63 %.
Spp. known from Siam ..	21=84 %.	2=25 %.
Spp known from Siam, but not Burma or Assam	6=24 %.	0
Spp. known from Burma or Assam, but not Siam	1= 4 %.	4=50 %.

Thus, so far as one can judge from a single collection, the fauna of the low-lying districts bears a strong relationship to that of Siam, whilst the more scanty fauna of the high ground is more closely related to that of Burma and Assam.

XXXI.—*Papers on Oriental* Carabidæ.—XV.

By H. E. Andrewes.

NEBRIINI.

Nebria elegans, sp. n.

Length 12·0–15·0 mm.; width 4·25–5·25 mm.

Black, with two widely separated red spots on the head; palpi brown, antennæ and legs piceous.

Body winged. *Head* flat, wide, moderately shiny, with a fairly deep impunctate constriction behind eyes, surface minutely and sparsely punctulate, some fine longitudinal striæ at sides, frontal foveæ obsolescent, clypeus slightly emarginate, uneven in front, suture fine but distinct, labrum transverse and emarginate; gula with a row of setæ on each side, mentum with a broad, faintly notched tooth, antennæ rather slender, reaching middle of elytra, joint 2 of labial palpi bisetose. *Prothorax* cordate, moderately convex, transverse, not very much wider than head, widest at a fourth from apex, extremities truncate, base bending backwards at sides close to angles, distinctly narrower than apex, which is unbordered, sides with a narrow but strongly reflected border, the front lateral pore on the margin, causing a distinct break in outline, strongly rounded in front, sharply contracted behind, and sinuate just before hind angles, which project a little backwards and are consequently slightly acute, front angles rather advanced but rounded ; median line shallow, extending between the two transverse impressions, which, with the basal foveæ, are deep ; disk smooth, sides slightly and minutely striate-punctate, moderately punctate along the course of the transverse impressions and in the foveæ and marginal channels. *Elytra* elongate-ovate, moderately convex, rather strongly narrowed towards base, with sloping shoulders, quite half as wide again as prothorax, three-fourths as long again as wide, widest at two-fifths from apex, a narrow reflexed border, slightly sinuate behind shoulder and again before apex ; fairly deeply striate-punctate, both striæ and punctures fainter on apical third, intervals smooth, moderately convex in front, flat behind, apex of 4–8 only slightly raised, 1 without pore at base, 3 with about half a dozen setiferous pores adjoining stria 3. *Sternum* : prosternal process not bordered, metepisterna moderately long. *Venter* : the segments with two or three setæ on each side, placed close together, apical segment ♂ with one, ♀ with two marginal setæ on each side. *Legs* : tarsi glabrous on upper surface, protarsi ♂ with two dilated joints, joint 4 of metatarsi produced beneath.

Allied to *N. desgodinsi*, Oberth., and *N. himalayica*, Bates. Distinguished from the former by the form of the elytra, which are distinctly dilated behind, and by the absence of a setiferous pore at the base of the elytra. From *himalayica* it may also be known by the form of the elytra, the striæ of the elytra less convex, evanescent at apex and with a less conspicuous carina, ventral segments with only two or three setæ on each side instead of five or six.

UNITED PROVINCES: Kumaon, West Almora division, Sunderdhunga, 8000–12,000 feet (*H. G. Champion*). Type in the British Museum. This is the species referred to by Mr. M. Bänninger as ?*himalayica*, Bates (Kol. Rundsch. 1923, pp. 131 and 138).

Nebria pindarica, sp. n.

Length 12·5 mm. ; width 4·5 mm.

Black; palpi, antennæ, apex of femora, tibiæ, and tarsi piceous.

Body (apparently) apterous. *Head* rather narrow, moderately constricted behind eyes, surface nearly smooth, with a few irregular light scratches, two widely separated small red spots on vertex, frontal foveæ obsolete, clypeus lightly emarginate, depressed in front, labrum truncate; gula with a row of setæ on each side, tooth of mentum distinctly notched, joint 2 of labial palpi bisetose, antennæ slender, reaching middle of elytra. *Prothorax* cordate, moderately convex, a little transverse, not much wider than head, extremities truncate, base a little narrower than apex, sides with a narrow reflexed border and a single lateral seta within the border rather before middle, moderately rounded in front and sinuate behind near the angles, which are right, front angles slightly advanced, not quite touching neck; median line very faint, transverse impressions deep and with the lateral channels rather indistinctly rugose-punctate, disk with some faint cross-striation. *Elytra* flat, elongate-ovate, rather strongly dilated behind, widest behind middle, two-thirds as wide again as prothorax, and as much longer than wide, shoulders very sloping, separately though rather sharply rounded at apex, border narrow and reflexed, faintly sinuate behind shoulder; striæ punctate, very lightly impressed, except close to base, and evanescent at sides and apex, intervals flat, without any apical carina, 1 with a pore on left side only, 3 with four small pores on left elytron, two on right. *Sternum* with some slight puncturation at sides, prosternal process very vaguely bordered, metepisterna about half as long again as wide. *Venter*: the segments with 3 to 5 setæ on each side, apical segment (♀) with two setæ on each side. *Legs*: tarsi glabrous, joint 4 of metatarsi obliquely truncate at apex and strongly produced beneath.

United Provinces: Pindar Valley, 8000–11,000 feet, 1 ex., ♀ (*H. G. Champion*). This type will be placed in the British Museum.

Though allied to *N. oxyptera*, Dan., the new species seems to fall within the definition of the subgenus *Nebriola*, and is near to both *N. mellyi*, Gebl., and *N. masrina*, Andr. The presence of two setæ only on the inner margin of joint 2 of the labial palpi instead of three is unexpected; further material is required to ascertain whether this is normal or accidental. The species is extremely like *masrina*, but a little smaller; neck with a much more evident constriction, prothorax rather narrower and with blunter hind angles, elytra with even more sloping shoulders, the striæ much finer and more evanescent at sides and apex, no carina at apex, interval 3 with some punctures, joint 4 of metatarsi less produced.

Nebria cameroni, sp. n.

Length 10·5–11·0 mm.; width 4·3–4·5 mm.

Testaceous-red; palpi, joints 1–4 of antennæ and legs (except tarsi) flavous; a triangular spot towards apex of each elytron, its base running along the middle of interval 8, its apex touching stria 2, and a large patch on the underside, including meso- and metasternum, with their episterna, base of ventral surface narrowly, and meso- and metacoxæ black.

Body winged. *Head* flat, wide, and dull, neck inflated, with hardly a trace of constriction, smooth, a few fine striæ near eyes, frontal foveæ obsolescent, clypeus slightly emarginate, finely rugose, suture arcuate, very fine, labrum rather narrow, distinctly emarginate; gula with a row of four setæ on each side just behind suture of mentum, which has a deeply notched tooth, joint 2 of labial palpi trisetose, antennæ stout, hardly reaching middle of elytra, joint 1 with a single seta. *Prothorax* cordate, moderately convex, strongly transverse, much wider than head, widest rather before middle, base bisinuate, a little narrower than apex, which is distinctly emarginate, its sides only bordered, sides a little explanate, with a narrow reflexed border, darker than disk, strongly rounded in front, sharply contracted behind, sinuate at a fifth from base, front angles slightly rounded, touching neck, hind angles rather acute and projecting laterally; median line fine, reaching extremities, transverse impressions and basal foveæ all fairly deep, the foveæ curved and produced a little on to disk, apical and side margins finely, base rather rugosely punctate, the disk smooth, but dull. *Elytra* rather flat, short, and wide, with square shoulders, about half as wide again as prothorax, and rather more than half as long again as wide; sides parallel, with narrow hardly reflexed border, very faintly sinuate behind shoulder and near apex; deeply punctate-striate, the striæ not effaced behind, intervals smooth, shiny, and convex, the apex of 4–8 raised into a short carina, 1 with a pore at base, 3 with two (sometimes three) pores, not far apart and about a third from apex. *Sternum*: meso- and metepisterna punctate, latter moderately elongate. *Venter*: the segments with a single seta on each side, anal segment ♂ ♀ with two setæ on each side. *Legs*: tarsi rather strongly pubescent on upper surface, protarsi ♂ with three dilated joints, metatarsi with joint 4 obliquely truncate at apex and slightly produced beneath.

United Provinces: Mussoorie, Rajpur, Arni Gad (*Dr. M. Cameron*); Dehra Dun (*Dr. M. Cameron* and *S. N. Chatterjee*); Siwalik Hills, Mohan Rau (*Dr. M. Cameron*) (all Forest Res. Inst.); West Almora (*H. G. Champion*). Type in the British Museum.

The species is widely different in appearance from any other known at present from India. Superficially like *N. pulcherrima*, Bates, from China and Japan, it is more nearly allied to the South European *N. testacea*, Oliv. From the latter it differs in the less explanate margins of the prothorax, with very narrow brownish border, wider elytra, with very square and more rounded shoulders, and much deeper striæ.

Nebria aborana, sp. n.

Length 11·0–12·0 mm.; width 4·5–5·25 mm.

Black; front of head (above and beneath), palpi, and antennæ ferruginous; epipleuræ and apical border of elytra, venter, and legs (knees and tarsi darker) testaceous.

Body winged. *Head* wide, smooth, not contracted or constricted behind, finely striate near eyes, a few punctures at sides behind, labrum a little advanced at middle, clypeus truncate, suture very fine, frontal impressions shallow, tooth of mentum clearly notched, submentum with a row of 4 setæ on each side, joint 2 of labial palpi 3-setose, antennæ slender, reaching middle of elytra. *Prothorax* convex, cordate, transverse, considerably wider that head, base bisinuate, hardly narrower than apex, sides rather widely explanate, border narrow and very little reflexed, the front seta within it, strongly rounded in front and contracted behind, hind angles right and projecting a little laterally; median line fine, transverse impressions deep, basal foveæ deep and elongate, disk smooth, the impressions, sides, and base punctate. *Elytra* rather short and wide, with square shoulders, apex narrowly rounded, sides very gently rounded, barely half as wide again as prothorax, a little more than half as long again as wide; striæ deep and finely crenulate, not much shallower behind, striole long; intervals smooth and convex, 1 with a minute pore at base adjoining stria 1, 3 without pores, apical carina not much raised. Microsculpture of elytra with moderately transverse meshes. *Sternum* punctate at sides, prosternal process bordered, metepisterna fully half as long again as wide. *Venter* punctate at sides of base, segments with a single seta on each side. *Leys*: tarsi pubescent on upper surface, protarsi ♂ with 3 dilated joints, joint 4 of metatarsi not produced beneath.

Assam: Naga Hills, 4000 feet (*S. N. Chatterjee*—Forest Res. Inst.), 4 ex.; Banks of Dihong River, Janakmukh, 600 feet (*Dr. S. W. Kemp*, Abor Expedition, Ind. Mus.), 2 ex. The type is in the British Museum.

Closely allied to the group *pulcherrima*, Bates—*pulchrior*, Maindr.,—*bourderyi*, Maindr., and perhaps only a local race. In coloration it is very different from all of them, and another striking difference is the depth and length of the basal foveæ of the prothorax. Compared with *pulcherrima* the head is narrower, the prothorax more strongly rounded in front and sinuate behind, the elytra a little more deeply striate, the outer striæ (5 to 7) especially being evidently deeper.

Nebria cinctella, sp. n.

Length 11·0–12·0 mm.; width 4·75–5·0 mm.

Flavous, tarsi and apical joints of antennæ a little darker; elytra black and rather shiny, with the border to stria 8 and the apex (rather widely) flavous; a considerable black area on the underside, including base of prosternum, meso- and metasterna, with their episterna, coxæ, and base of venter.

Body winged. *Head* wide and rather flat, neck without constriction, surface nearly smooth, foveæ shallow, the suture slight, ending at each side in a small pore; gula with two setæ on each side near buccal fissure, tooth of mentum clearly emarginate, joint 2 of labial palpi trisetose, antennæ reaching middle of elytra. *Prothorax* cordate, transverse, clearly wider than head, base bisinuate, a little narrower than apex, sides with a narrow, slightly reflexed border, the seta within it, moderately rounded and sinuate some little way before base, hind angles right and sharp; median line fine, transverse impressions deep, surface smooth on disk, margins finely rugose-punctate, basal area more coarsely punctate. *Elytra* rather short and wide, with square shoulders, border barely sinuate, apex narrowly rounded, more than half as wide again as prothorax, and about half as long again as wide; sides nearly parallel, with narrow border; striæ deeply punctate-striate, the striole long, intervals smooth and rather shiny, the carina at apex not at all sharp, a small and ill-defined puncture at base of 1, interval 3 impunctate in one example, while in the other there are two punctures on the left elytron, one on the right. There is a microsculpture of moderately transverse meshes (on average about twice as wide as long), finer on the prothorax than on the elytra. The metepisterna are half as long again as wide, venter with 1 or 2 setæ on each side, ♂ protarsi with 3 dilated joints, joint 4 of metatarsi not produced beneath.

UNITED PROVINCES: Dehra Dun, Mothronwala (*Dr. M. Cameron*), 2 ex., ♂ ♀. The type is in the British Museum.

In appearance this species is extremely like *N. bourderyi*, Maindr., from Yunnan, but it is much more closely allied to *N. xanthacra*, Chaud. Though differing altogether in coloration, it agrees very nearly with the latter species in size and shape. The elytra are rounded at apex instead of sharply pointed, the striæ more deeply punctate-striate and the intervals more convex; the carina at apex is not so sharp, and the punctures on intervals 1 and 3 much reduced. The microsculpture consists of transverse instead of isodiametric meshes.

Nebria xanthacra, Chaud. Bull. Mosc. 1850, ii. 423.

Var. *nigricollis*, nov.

In the typical form the prothorax is brown, and in Mr. Breit's var. *apicalis* (Col. Rundsch. 1914, 160) it is yellowish red. In other specimens from the Himalayas it is entirely black, and for these I propose the above name.

Leïstus nivium, sp. n.

Length 9·0 mm.; width 3·0 mm.

Piceous-black; mandibles, palpi, joints 2–11 of antennæ, apex of femora, tibiæ, and tarsi testaceous-red.

Head relatively narrow, rather convex, strongly constricted behind eyes, nearly smooth, but rather dull, one or two minute punctures behind eyes, clypeus and sides of front minutely rugose, clypeus truncate in front, suture fine, curved, labrum wide, arcuate in front, mandibles very short in front of lateral dilatation, four bristles at base of mentum, arising from minute tubercles, process at base of submentum also with four bristles, squama palpigera with two long bristles, one terminal and one just below it, both directed inwards. *Prothorax* convex, transverse, considerably wider than head, widest a little before middle and about equally contracted at extremities, base truncate, apex slightly emarginate, sides moderately explanate, bordered only in front, strongly rounded in front, sinuate a little before hind angles, which are right and very sharp; median line fine, but well marked in middle, transverse impressions and basal foveæ deep, surface smooth but with some very fine transverse striæ, base and apex coarsely but sparsely punctate, explanate margin uneven rather than punctate. *Elytra* elongate-oval, moderately convex, nearly half as wide again as prothorax, with narrow reflexed border, base with well-marked border, which forms almost a tooth at its junction with side-border, sides faintly sinuate before apex; deeply punctate-striate, the punctures not very large, the outer striæ rather faint towards apex, intervals convex, smooth, 3 with five pores, evenly distributed, the hindmost quite close to apex. *Sternum*: sterna (except middle of metasternum) and episterna coarsely punctate. *Venter* coarsely punctate at base, segments with a seta on each side of middle line, anal segment in ♀ (the only sex known) with two setæ on each side.

The new species will easily be distinguished from *L. indus*, Tchitch., by its piceous colour, the presence of four bristles (instead of two) at base of mentum, and elytral interval 3 with five pores instead of three. From *L. championi*, Andr., it differs in the presence of four bristles (instead of 6) on the submentum, disk of prothorax impunctate, and apex of elytra without carina.

KASHMIR; Dusu. The unique type (♀) is in my collection, and I am indebted for it to Mr. M. Bänninger.

XXXII.—*A new Eel of the Genus* Congromuræna *from Tobago, with Notes on* C. balearica *and* C. opisthophthalmus. By J. R. NORMAN.

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Congromuræna guppyi, sp. n.

Depth of body about 17 in the total length, length of head (to upper angle of gill-opening) about 1½ in distance from gill-opening to vent. and 6⅘ in total length. Tail more than 1¾ as long as rest of fish. Snout projecting beyond mandible for a distance almost equal to diameter of eye. Anterior nostril without tube, placed near tip of snout; posterior in front of pupil of eye. Diameter of eye twice in length of snout, and 9 in head. Mouth rather large, the gape extending to below posterior border of eye. Teeth bluntly conical or granular, in moderately broad bands in the jaws, those of the outer series largest; præmaxillary patch of teeth separated from those on vomer by a transverse groove which receives the tip of the mandible; no teeth on shaft of vomer. Origin of dorsal immediately above upper angle of gill-opening. Pectoral 3⅔ in length of head. Brownish above, silvery white below; anterior parts of vertical fins pale, with a dusky margin, posterior parts blackish.

A single specimen, 950 mm. in total length, from Tobago; collected and presented to the British Museum by Mr. P. Lechmere Guppy.

This species differs from *C. opisthophthalmus*, Ranzani, in the strongly projecting snout and much longer tail; it may be distinguished from *C. prorigera*, Gilbert, chiefly by the shorter head, larger mouth, and more posterior origin of dorsal fin.

Jordan and Evermann * have expressed some doubt as to the identity of the American *C. opisthophthalmus*, Ranzani, with *C. balearica*, De la Roche, from the Mediterranean. These species have been united by most authors, but no direct comparison of material from the two localities appears to have been made. I have examined five specimens from different localities in the Mediterranean, and seven specimens from Cape Frio, Brazil, and conclude that these species may be regarded as distinct. *C. opisthophthalmus* may be distinguished chiefly by the longer tail and by the somewhat larger eye, as shown by the following measurements:—

Locality.	A.	B	C.	D.	E.
Nice	322	48	105	169	10·5
Malta......... ...	297	42	97	158	8·5
do.	364	51	123	190	9·7
Algiers	300	44	99	157	9
Spalato	275	42	86	147	8·2
Brazil...........	280	42	75	163	8
do.	253	38	70	145	7·5
do.	246	38	69	139	8
do	244	38	66	140	8
do.	220	35	59	126	7
do.	214	35	55	124	7·5
do.	175	29	47	99	6

A. = total length; B. = length from snout to gill-opening; C. = length from gill-opening to vent; D. = length from vent to tip of tail; E = diameter of eye. All measurements in millimetres.

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* Bull. U.S. Nat. Mus. xlvii. pt. i, 1896, p. 356.

XXXIII.—*Two new Cyprinoid Fishes of the Genus* Barbus *from Nyasaland and Siam.* By J. R. Norman.

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Barbus choloensis.

Depth of body 3 to $3\frac{1}{2}$ in the length, length of head $3\frac{3}{5}$ to $3\frac{3}{4}$. Snout equal to or a little longer than diameter of eye, which is $3\frac{1}{4}$ to 4 in length of head; interorbital width about 3. Mouth small, terminal, the maxillary extending to below nostrils or slightly beyond; two barbels on each side, anterior $\frac{3}{5}$ to $\frac{3}{4}$ diameter of eye, posterior $\frac{7}{10}$ to $1\frac{1}{3}$; fold of lower lip interrupted. Scales radiately striated, 28 to 30 in a longitudinal series, 9 or 10 between origin of dorsal and root of pelvic, 14 round caudal peduncle. Dorsal III 8, equidistant from anterior border or middle of eye and base of caudal; third ray a serrated spine, $\frac{3}{5}$ to $\frac{4}{5}$ length of head; free edge of fin a little concave. Anal III 5. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, not reaching pelvics, which are below anterior half of dorsal. Caudal peduncle nearly twice as long as deep. Brownish above, a dark network at edges of scales; a blackish lateral band on posterior half of body.

Twelve specimens, 55 to 130 mm. in total length, from Nyasaland (Nswadzi River, Cholo, 2700 feet); collected and presented to the British Museum by Mr. Rodney C. Wood.

Near *B. wellmani*, Boulenger, from Angola, which is more slender, has a longer maxillary, extending to below edge of eye or beyond, and a shorter caudal peduncle, which is surrounded by 12 series of scales.

Mr. Wood's collection also contains a specimen of *Barbus litamba*, Keilhack, from Lake Nyassa, a species new to the Museum. In his Catalogue (Afr. F. W. Fish. ii. p. 143), Boulenger, by an error of transcription, described this species as having an inferior mouth; but the lower jaw is strongly projecting, as stated in Keilhack's description.

Barbus vernayi.

Depth of body $2\frac{1}{3}$ to $2\frac{3}{5}$ in the length, length of head about 4. Breadth of head $1\frac{3}{5}$ to $1\frac{2}{3}$ in the length. Snout as long as diameter of eye, which is $3\frac{1}{3}$ to $3\frac{1}{2}$ in length of head; interorbital width $2\frac{1}{3}$. Mouth small, terminal, the lower jaw included; maxillary scarcely reaching anterior edge of eye; fold of lower lip interrupted; two barbels on each side, anterior a little shorter than posterior, which is equal to or a little longer than eye. Scales longitudinally striated, 26 to 27 in a longitudinal series, 5 between lateral line and origin of dorsal, 3 between lateral line and root of pelvic. Dorsal IV 8, equidistant from occiput and base of caudal; last simple ray a stout spine with strongly serrated posterior edges, stiff portion about ¾ length of head; free edge of fin concave. Anal III 5. Pectoral shorter than head, not reaching pelvics, which are inserted below anterior half of dorsal. Caudal deeply forked, the lobes much longer than head. Caudal peduncle 1⅙ to 1¼ times as long as deep. Silvery, back darker; a dark brown network at edges of scales.

Two specimens, 135 and 185 mm. in total length, from 40 to 50 miles east of Um Pang, Me Wong River, Siam; collected by Mr. A. S. Vernay and Mr. Willoughby P. Lowe.

Near *B. huguenini*, Bleeker, and *B. binotatus*, Cuv. and Val., differing from the former in the longer head and larger scales and from the latter especially in the form of the osseous dorsal spine.

XXXIV.—*Some new Earthworms from Rangoon, Burma.* By G. E. Gates, Lecturer in Biology, Judson College, Rangoon, Burma.

MONILIGASTRINÆ.

Drawida peguana, sp. n.

Description of Type-specimen.—External Characters. Length 96 mm.; diameter 4 mm. Number of segments 168.

Colour a bluish grey with a marked greenish iridescence. The blue shade is more pronounced dorsally, anteriorly, and especially in the mid-dorsal line.

The prostomium is prolobous. There are no secondary annulations or dorsal pores. The ventral surface is flattened anteriorly.

The setæ are eight per segment, closely paired, and begin on ii. Posterior to the clitellum *ab* is equal to *cd*, *aa* is equal to one-half of *bc*, and *dd* is equal to one-half of the circumference. On the clitellum and anteriorly the setal intervals *aa* and *bc* are about equal.

The clitellum is probably on segments x.–xiii. (4). These segments are lighter in colour and wider. On the clitellar segments the nephridiopores are just posterior to the intersegmental furrows and in line with *d*. On many of the segments behind the clitellum these pores can be seen in the same position.

The spermathecal apertures are in 7/8 in line with *d*. The male apertures are probably in 10/11 external to *b*. The female pores are in 11/12 in line with setæ *b*.

Paired areas bearing papillæ are present on vii., viii., x., and xi. On vii. these areas are whitish and slightly swollen, and stretch from the setal zone of vii. to 7/8, and from slightly outside *d* to halfway between *c* and *b*. Each of these areas contains two minute papillæ close to the intersegmental furrow. On viii. there are similar areas in line with those on vii., and with the same extent, except that they lie between 7/8 and the setal zone of viii. These also contain a pair of minute papillæ close to 7/8. The spermathecal pores lie at the centre of a square whose four corners are these four papillæ. On x. there are similar swollen areas lying between the setæ and 10/11, with the outer boundary about in line with the inner boundary of the areas on vii. and viii. and the inner boundary about in line with *b*. In the centre of each of these areas is a single papilla. On xi. there are two more areas in line with those on x., but between 10/11 and the setæ on xi. In each of these areas close to 10/11 are two minute papillæ about the same size as those near 7/8. In the centre of each of these areas on xi. is a small round crater with a concave floor.

Internal Anatomy. Septa 5/6, 6/7, 7/8, 8/9 are present and thickened. 9/10 is thin and displaced backwards nearly ⅔ of a segment, according to the external segmentation; 10/11 is displaced backwards by the same amount, while 11/12 is only very slightly displaced. The succeeding septa correspond in position with the external annulation.

The gizzards are three, in xv., xvi., and xvii., telescoped into each other, so that there appears to be a single long gizzard passing through the three segments. After dissecting off the septa the gizzards can be pulled apart to show the soft annuli.

Hearts are present in vi., vii., viii., and ix.

The testis-sacs are smooth-surfaced and asymmetrical. The right sac is the larger and projects further into ix., and appears to lie in xii., having pushed through the ovarian chamber. This sac is covered with thin sheets of connective tissue posteriorly, and when the former is pulled forward into x., these latter fall into the normal positions for septa 10/11 and 11/12. The sac on the left side, except for a short projection into ix., is confined to x., and is shorter and thicker than the other. The vas deferens hangs in several loops on the posterior face of 9/10 underneath the testis-sac, and then passes across to the prostate, which it joins at about the middle of its length just below the place of greatest enlargement. The prostate consists of a very thin duct-like portion, which is smooth and separated from the rest of the organ by a sharp constriction. The remainder is larger, coarsely granular, and gradually enlarges to the knob-like end. The duct portion lies on the floor close to 10/11 at right angles to the nerve-cord, and just after the beginning of the glandular portion bends forward and then upward against the alimentary canal.

Segment xi. is very narrow, but 10/11 and 11/12 are attached to the parietes both dorsally and ventrally, and when the worm is opened from the dorsal side the ova fall out of the segment. Internally the septa pass to the œsophagus, but the ovarian chamber is closed off, so that there is an annulus around the œsophagus which is free from ova, and bounded anteriorly and posteriorly by the septa. The ovisac on the right side passes by a very small neck through xii., and lies in xiii. and xiv., where it is enlarged and bent into an irregular U-shape. The left sac lies in xii., xiii., and xiv.

The spermathecal ampullæ are ovoid and attached to the posterior face of 7/8, and to each other by a thin sheet of connective tissue. The duct is elaborately coiled underneath the ampulla, and after giving off an atrium in vii. passes into the body-wall in the region of *cd*. The atrium consists of a stalk which is about as thick as the duct of the ampulla, and which passes into an elongate finger-shaped sac nearly as long as the stalk.

Habitat. Rangoon, Insein, and the district around these two towns, June to December. Occurs in gardens, lawns (especially around the base of trees), and in the jungle.

Remarks. The setal intervals vary somewhat—thus *aa* may be slightly less than one-half of *bc* in some specimens, while in others it may be more than one-half of *bc*. In the majority of worms examined *aa* was one-half or less than one-half of *bc*.

Freehand transverse sections through the body-wall show an outer whitish opaque layer, an inner translucent layer at least twice as thick as the outer layer, and between these two layers a thin stratum of blue pigment granules. This stratum is thicker on the dorsal side than on the ventral, and is thickest in the region of the mid-dorsal line. Staining with eosin solution showed that the pigment is between the circular and longitudinal muscle-layers.

The testis-sacs are in most cases confined to ix. and x. There are, however, a number of specimens in which one of the sacs appeared to extend into xii. The contents of the sacs are adherent to the wall, and cannot be easily dissected out. A more densely opaque mass on the inner wall of the sac near the place of origin of the vas deferens probably represents the funnel.

The ventral wall of the peri-œsophageal annulus in xi. is a longitudinal sheet of tissue that extends at least through ix., x., xi., and xii., and which forms a tunnel through these segments in which the nerve-cord lies. The ventral blood-vessel lies in or suspended from this sheet of tissue. The septa bounding the segments mentioned are incomplete in the region of the nerve-cord. Stephenson has described a similar condition in *Drawida japonica* (4, p. 129).

The septa 10/11 and 11/12 are very weak internal to the inner boundary of the ovarian chamber, and in this region the testis-sacs push through into xii. In those specimens in which the sacs are narrow enough to permit withdrawal into x. two thin septa can be seen to follow the receding sac back into their normal positions. These sacs then are really confined to ix. and x.

The ovisacs may lie only in xii. or may extend through xii., xiii., and xiv. The ovaries are attached to the inner wall of the ovarian chamber, and the rest of the chamber is filled with loose ova and yolk masses.

The gizzards were examined in six specimens, in three of which they occurred in xv., xvi., and xvii.; in the other three the gizzards were in xiv., xv., and xvi.

Of the forty-two species of *Drawida* that Stephenson lists in his Fauna volume (5) the present species most resembles *D. papillifer* from the Chittagong Hill Tracts in Rangamati, a district of Bengal on the Western border of Burma. Reference to the original description of that form shows that the two species differ in size, pigmentation, width of ovarian chamber, prostate, spermathecal apparatus, and the genital papillæ. It should be noted, however, that *D. papillifer* was described from a single specimen.

Drawida rangoonensis, sp. n.

Description of Type-specimen.—External Characters. Length 82 mm.; diameter 2½ mm. Number of segments 161. Unpigmented. No dorsal pores. Prostomium prolobous.

Setæ eight per segment. They begin on segment ii. and are closely paired; *cd* is equal to *ab*; *aa* is slightly less than *bc*; and *dd* is equal to one-half of the circumference.

Clitellum not distinguishable.

The spermathecal apertures are in 7/8 in line with *c*. The male apertures are not visible. The female pores are in 11/12 in line with *b*.

On each side of x. just external to *b* is a deep depression which has sharply marked posterior and external borders but gentle slopes anteriorly and internally. Immediately external to this depression on each side is a ridge, and just behind the depression is a papilla which forms the internal edge of the ridge in this region, so that the ridge appears to bend around behind the depression. The external borders of these two papillæ, which are nearly circular, are not sharply marked. Posteriorly the ridge is continued backwards on to segments xi. and xii., lying close to the line of setæ *b*.

Internal Anatomy. Septa 5/6, 6/7, 7/8, and 8/9 are present and thickened; 9/10 is thin and displaced backwards at least one-half of a segment. A septum is present just behind 11/12 as indicated by the external furrows and one septum is missing dorsally. The following septa are thin and normally attached.

The gizzards are three in number in xiv., xv., and xvi. They are subspherical and separated by soft annuli.

Paired hearts are present in vi., vii., viii., and ix.

The testis-sacs are large, horizontal in position, and asymmetrical. The sac on the right side lies half in ix. and half in x. The left sac lies wholly in x., but pushes back the succeeding septa somewhat. The vas deferens is wide, and formed into a large coiled mass which is attached to the posterior face of 9/10 underneath the testis-sacs, and is nearly half as large as the sac above. The vas passes into the prostate not quite halfway from the ental end on the left side and still nearer the ental end on the right side. The prostate is pear-shaped, erect on the left side, and bent towards the intestine on the right side. The surface is granular as in the preceding species.

The ovarian chamber is formed by the bending backward and fusing of 10/11 with 11/12. 10/11 is attached to the ventral parietes only. The chamber is almost empty. The ovisacs are shrunken yellow-coloured bodies extending back to segment xiii.

The spermathecal ampullæ are ovoid and attached to each other and the posterior face of 7/8 by a thin sheet of connective tissue. The duct is fine, slightly coiled, and passes along the septum to the parietes at the region of *cd*. The atria are large erect sacs in vii., bent round the œsophagus so that they are in contact dorsally. The sacs narrow close to the septum, through which they communicate with the duct in viii.

Habitat. Rangoon. The present specimens were obtained in November.

Remarks. Other specimens were 90–92 mm. long. In many specimens the coiled vas equalled in size the testis-sacs. Three specimens had gizzards in xiv., xv., and xvi. One specimen had gizzards in xv. and xvi. Another had gizzards in xiii., xiv., and xv., with a rudimentary gizzard in xvi. The atria are surprisingly large. taking into account the size of the worm.

Drawida rara, sp. n.

Description of Type-specimen.—*External characters.* Length 56 mm.; diameter 3 mm. Number of segments 154. Unpigmented. No secondary annulations or dorsal pores. Prostomium prolobous.

Setæ eight per segment; begin on ii.; *ab* is equal to *cd*; *aa* is slightly less than *bc*; *dd* equals one-half of the circumference. These proportions remain the same the whole length of the worm.

The clitellum is not distinguishable.

The spermathecal apertures are in 7/8 in line with *c*. The male apertures are not visible. The female pores are in 11/12 in line with *b*.

On x. just anterior to the row of setæ and extending on each side to just beyond *b* is a single slightly crescent-shaped area with the long axis transverse to the long axis of the worm. In 10/11 are a pair of large conical papillæ external to *b*, extending posteriorly to the line of setæ on xi. and anteriorly only part way to the line of setæ on x. Anterior and slightly external to each of these papillæ is a smaller circular papilla.

Internal Anatomy. Septa 5/6, 6/7, 7/8, and 8/9 are present and thickened; 9/10 is displaced backwards at least one-half of a segment. The ovarian chamber is collapsed and empty, and it is difficult to discover the relations of the septa in this region. There is a septum in the region of the groove 11/12, and 10/11 is attached to the ventral parietes and probably bends backward and fuses with 11/12 in such a way as to form an ovarian chamber.

There are gizzards in xiii., xiv., xv., xvi., and xvii.; 17/18 and 18/19 are close together, and in this segment the œsophagus is a soft brown annulus, while in xix. the œsophagus is slightly thickened and whitish.

There are paired hearts in v., vi., vii., viii., and ix.

The testis-sacs are fairly large, horizontal, dorsal to the œsophagus. About half of each sac projects into ix. without any sharp constriction. The vas deferens is a slightly coiled mass attached to the posterior face of 9/10 underneath the testis-sacs, and passes approximately into the centre of the prostate. The prostates are dome-shaped, coarsely granular masses sessile on the floor of the segment. The granulations are rather large and rounded, and the surface of the gland resembles that of a raspberry or blackberry.

The ovisacs are very small, finger-shaped, and confined to segment xii.

The spermathecal ampullæ are large, flattened, and oval in outline. They are attached to each other and to the septum by a thin sheet of connective tissue. The duct is fine, and forms a loosely-coiled mass on the posterior face of 7/8, along which it runs to pass into the body-wall in the region of *cd*. There are no atria.

Habitat. Rangoon. Six specimens were obtained during November and December.

This form is very rare, and before this was discovered all but one of the specimens had been dissected. It was, therefore, necessary to describe the species from the remaining specimen as the type. This is rather unfortunate, as this specimen is abnormal in several respects. In all the specimens, except the type-specimen, there is a large ovarian chamber with walls distended by the yellow contents. The chamber is formed by 10/11 bending backwards and fusing with 11/12 in such a way as to form a closed U-shaped tube around the œsophagus with the arch of the U dorsal to the œsophagus. Internal to this tube is the annulus in which the alimentary canal lies, bordered anteriorly and posteriorly by the septa bounding the ovarian chamber. The ovisacs are large, and fill the space in segments xii. and xiii. between the parietes and the alimentary canal. These are also yellow-coloured. The colour of these organs visible through the body-wall aids in distinguishing this species from *D. peguana.*

In three specimens the gizzards were three in number in segments xv., xvi., and xvii. In the fourth specimen they were in xiv., xv., and xvi.; and in the fifth they were in xv., xvi., and xvii., with rudimentary gizzards in xiii. and xiv.

In the other five worms the prostates were flattened, circular, slightly raised, coarsely granular areas on the floor of segment x.

The papillæ are also variable. Three specimens lacked the crescentic area on the anterior part of x. On the fourth specimen the single crescent-shaped area was replaced by two nearly round, flat, smooth, slightly elevated areas each external to *b*. The fifth specimen had these two areas on the anterior part of x. and the two papillæ in 10/11, but lacked the intermediate pair.

These three species differ from all of the forty-two which Stephenson lists in the Fauna volume in important points of specific distinction. There is, however (5, p. 121), one species of this genus occurring in Borneo which is not found in India. Unfortunately descriptions of the Borneo form are not available in this province. There is, therefore, a possibility that one of these species may be the same as that found in Borneo.

OCTOCHÆTINÆ.

Eutyphœus peguanus, sp. n.

Description of Type-specimen.—External Characters. Length 218 mm.; diameter behind the clitellum 7 mm. Number of segments 298. Colour anterior to the clitellum a deep greyish, posteriorly a very light whitish grey.

Segments iv. and v. are biannulate, each having a secondary furrow posterior to the line of setæ. Segment vi. is triannulate, having a deep segmental furrow anterior to the line of setæ and another posterior to the setæ. On vii. there are two similar deep furrows, but the anterior and posterior annuli formed by these furrows are subdivided by slighter furrows, so that this segment has five annuli. Segment viii. also has five annuli. On ix. there are five slight secondary furrows; four on x.; six on xi.; and five on xii.

The prostomium is large, combined pro- and epilobous.

The first dorsal pore is large and occurs in 11/12, the pore in 12/13 is lacking, and that on 13/14 is indicated but is not functional. The next is in 17/18, and from here on the pores are present.

The setæ begin on ii., are eight in number, but only four are paired. On segment xxii. $ab = \frac{1}{6}aa = \frac{1}{3}bc = \frac{1}{2}cd$; *dd* is greater than one-half of the circumference. Posteriorly $ab < bc < cd < aa$; *dd* about equals one-half of the circumference.

The clitellum is smooth, deep brown in colour, and extends from just in front of the setæ on xiii. to the setæ on xvii., except ventrally in the region between the copulatory areas where it ends at the intersegmental furrow 16/17. It is ring-shaped. The setæ are present on all the segments in their usual positions. Only one dorsal pore is indicated in this specimen.

The spermathecal apertures are large, in 7/8, halfway between *b* and *c*, surrounded by small puckered lips. The female pores are minute diagonal slits on xiv., just anterior to and internal to *a*. The male apertures are on the posterior third of the copulatory areas on xvii. just external to *b*.

The genital markings on xvii. are a pair of large, smooth, uncoloured, slightly elevated, circular areas. They extend from 17/18 to 16/17, which latter groove is pushed slightly forward, and in a transverse direction from internal to *a* to halfway between *b* and *c*. On the posterior third of these areas are the penial setæ. A similar although slightly smaller pair of genital papillæ occupies similar positions on xxi.

Internal Anatomy. Septa 4/5 and 5/6 are present and thickened; 6/7 and 7/8 are absent; 8/9 and 9/10 are thickened and displaced backwards close together. Segment xi. appears from the dorsal dissection as a matted mass of connective tissue around the œsophagus. Septum 12/13 is thin and bulged backwards by the testis-sacs. Succeeding septa present and normal.

The gizzard is large and barrel-shaped in the space of segments vi., vii., and viii. Large calciferous glands similar in structure to those described by Stephenson from dissection of *E. gigas* are present in xii., reducing the lumen of the œsophagus to a narrow vertical passage. The transverse lamellæ are deep red. No calcareous particles are visible. The intestine begins in xv. In xxviii. there are a pair of downwardly projecting intestinal cæca filled with soil like the intestine. On the cæcum of the left side is a secondary sac. Dorsal to the intestine and separated by the dorsal blood-vessel in nine succeeding segments, about

Fig. 1.

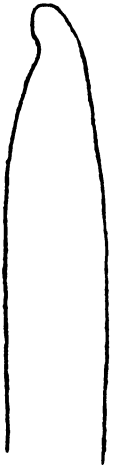

Fig. 2.

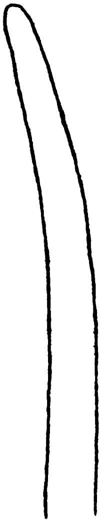

Fig. 3.

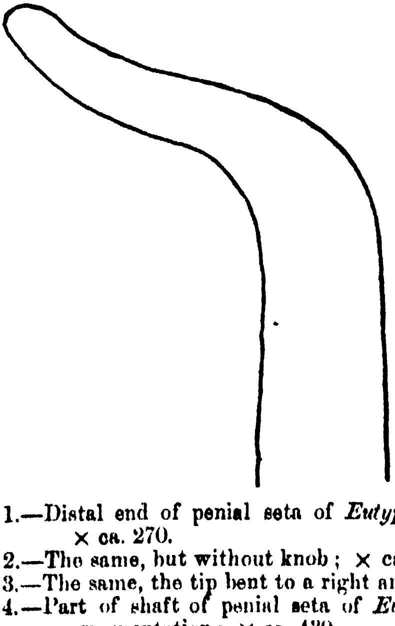

Fig. 4.

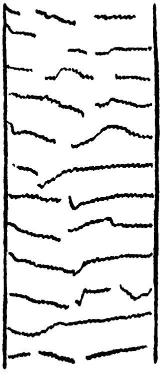

Fig. 1.—Distal end of penial seta of *Eutyphœus peguanus*, with knob; × ca. 270.

Fig. 2.—The same, but without knob; × ca. 270.

Fig. 3.—The same, the tip bent to a right angle; × ca. 430.

Fig. 4.—Part of shaft of penial seta of *Eutyphœus peguanus*, showing ornamentation; × ca. 430.

115 mm. from the anterior end of the worm, are nine pairs of whitish glandular-like objects. These are solid and easily separated off from the intestine and the dorsal blood-vessel. The first pair of glands is the smallest, gradually increasing in size to the last pair which is the largest. The typhlosole begins in the region of segment xxviii.

The dorsal blood-vessel passes forward on the gizzard close to 5/6, and on the right side close to the septum gives off a large lateral commissure. The blood-supply of the gizzard is furnished by two pairs of small vessels, one pair anteriorly and one pair posteriorly, which ramify on the sides of the organ. These vessels pass backwards into two large ventro-lateral vessels, one of which also receives the commissure of the right side; these pass under septum 8/9. Under cover of this septum are two pairs of commissures, into the anterior pair of which the ventral lateral vessels seem to pass. But the relations of the vessels in this region are concealed by their attachment to small whitish masses of connective tissue. Efforts to dissect off this tissue have hitherto only resulted in breaking the vessels. The last pair of hearts is in xiii. (In all the other specimens dissected there are paired commissures anterior to the gizzard as well as the two pairs concealed under 8/9, and the dorsal blood-vessel continues through 5/6. There are thus paired commissures in segments vi.–xiii. inclusive.)

The seminal vesicles are large lobulated sacs, yellowish in colour, and confined to segment xii. The prostates are tubular coiled masses in xvii. and xviii. The duct is in xvii. sharply marked off from the gland, slightly twisted, and gradually enlarging towards the ectal end. The penial setæ were dissected out from one side, but were broken in an attempt to get rid of the surrounding tissue.

In other specimens they vary from 1·3 to 1·8 mm. in length, and from 35 to 50 μ in width near the base. The shaft is practically straight, and may end in a small knob at the distal extremity (fig. 1). Setæ lacking the knob have the extreme tip slightly bent, or bent almost at right angles (figs. 2, 3). The ornamentation begins 0·2 to 0·3 mm. from the distal end, and consists of transverse rows of very fine teeth (fig. 4).

The ovaries are rather large, coarsely granular bodies attached to the posterior face of 12/13. The funnels of the oviducts are large, with crenellated borders on the anterior face of 13/14. The oviducts are short and stout. The spermathecæ are practically sessile, the duct being confined to the body-wall; viewed dorsally the ampulla appears trilobed, one of the lobes being smaller than the others. The ampulla is filled with a granular brownish substance. The two small diverticula seem reniform, but masses of surrounding connective tissue conceal the real structure. The larger ental end is bent at right angles to the gradually narrowing duct-like portion. The whole thing looks like a straight-stemmed pipe.

Habitat. Rangoon, Insein, and the district around these towns, June to December. Occasionally found in the towns, but more often in the surrounding jungle.

Remarks. The number and position of the genital areas vary. Of the twenty-six specimens examined fifteen had the paired areas only on xvii.; six had paired areas on xvii. and xix.; two had paired areas on xvii. and xxi.; three had these areas on xvii., and a single area on the left side of xix. The setal intervals also vary, but the relationship is generally the same as that given for the posterior portion of the type-specimen.

Dorsal pores are sometimes indicated on the clitellar segments, but the only functional ones discovered were on 13/14 and 16/17. In all specimens examined the first dorsal pore was in 11/12.

Stephenson has called attention to the intestinal cæca in *E. gigas* (3, p. 410). Beddard found, according to the Fauna volume (most of Beddard's articles are not available in Burma), in *E. orientalis*: "Five glands increasing in size backwards, on the dorsal surface of the intestine towards the middle third of the body, some or all bilobed (*i.e.*, one lobe on each side of the middle line)" (5, p. 448).

It is evident that this worm differs from all of the twenty which Stephenson lists in the Fauna volume, and since this genus is confined to India this species must be new.

Rosa has applied the name *lævis* to a single worm which was obtained by Fea, west of Toungoo. This was so poorly preserved that it could not be investigated internally. Later, specimens found in Ceylon which were small in size and also poorly preserved were identified as *lævis*, although they, too, were not dissected. In *E. lævis bc* is greater than *cd* anteriorly, but posteriorly *cd* is greater than *bc*. In the present worm *bc* is less than *cd* throughout the whole length of the animal. In *E. lævis* the dorsal pores begin on 12/13 instead of 11/12. In the Ceylon specimens there were paired papillæ on xvii. and xviii. The description of the specimen from Burma is: "Aperture maschili al 17° segmento su tuberculi congiunti insieme e posti sulla serie ventrale di setole. . . . Papille copulatrici mancano" (2). It, therefore, appears that the present species differs both from the Burman and Ceylonese forms.

Two species of *Eutyphœus* in Burma and the possibility of a third will be facts of interest in the zoogeographical discussion concerning the Oligochæte fauna of India.

LITERATURE.

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(2) ROSA, D. "Viaggio di Leonardo Fea in Birmania e Regioni vicini. XXV. Moniligastridi, Geoscolecidi, ed Eudrilidi." Ann. Mus. Gen. (2) ix. (1890).

(3) STEPHENSON, J. "On a Collection of Oligochæta from various Parts of India and Further India" Rec. Ind. Mus. xiii., 1917.

(4) ——. "Contributions to the Morphology, Classification, and Zoogeography of Indian Oligochæta." P. Z. S. 1922.

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XXXV.—*Notes on the Coleopterous Families* Hybosoridæ *and* Trogidæ. By GILBERT J. ARROW, F.Z.S., F.E.S.

Genus LIPAROCHRUS.

One species was omitted from my Catalogue, published by Junk in 1912, viz., *L. rufus*, Blackb. (Trans. Roy. Soc. S. Australia, vol. xv. 1892, p. 25). One other species has been described since, viz., *L. hackeri*, Blackb. (Trans. Roy. Soc. S. Australia, vol. xlii. 1912, p. 40). A comparison of the types shows *L. timidus*, Arr. (1909), to be a synonym of *L. dilatifrons*, Blackb. (1905). *L. dolium*, Hell. (1912), is a synonym of *L. dux*, Arr. (1909), and *L. alternans*, Macl. (1886), is almost certainly synonymous with *L. papuus*, Lansb. (1885). By a printer's error *L. nitidicollis*, Blackb., is attributed in the Catalogue to New Guinea instead of N.W. Australia.

The two following species have not hitherto been described:—

Liparochrus lugubris, sp. n.

Nigro-brunneus, elytris, marginibus exceptis, fere atris, subopacis, antennis et tarsis rufis; late ovatus, convexus, capite et pronoto crebre punctatis, vix nitidis, clypei margine antico lævissime

sinuato, pronoto fere duplo latiori quam longitudinem, lateribus late deplanatis, paulo grossius punctatis, extus fortiter rotundatis, angulis anticis acute productis, posticis nullis, scutello excavato, punctato; elytris multicostatis, parte laterali fere verticali, costis subnitidis, striis punctatis separatis, parte dorsali sat deplanato, subopaco, costis angustis, spatiis striato-punctatis separatis, apicibus angulatim productis, fere verticalibus; corpore subtus dense transversim striolato, metasterno medio carina **V**-formi setigera instructo; tibiis anticis extus toto serratis, acute bidentatis:

♂, unguibus anticis paulo crassioribus, interiori basi inflexo:

♀, elytris dorso magis opacis.

Long. 13 mm.; lat. 8·5–9 mm.

New Guinea: Mamberamo River (*W. C. v. Heurn*, Dec.). In the British Museum and Berlin Entomological Institute.

This is nearly related to *L. dux*, Arr., and *ingens*, Felsche, but rather smaller than either, and readily distinguishable by its very closely sculptured surface. The sides of the pronotum are very broadly flattened and strongly punctured, the dorsal part slightly convex and very finely and closely punctured. The dorsal part of the elytra is almost opaque, while the lateral and apical parts, like the head and pronotum, are slightly shining. The opacity of the dorsal part is greater in the female than in the male. The **V**-shaped carina upon the metasternum, carrying a fringe of erect bristles, is present in the two allied species, but is rather less strongly developed.

Liparochrus crassicollis, sp. n.

Nigro-piceus, nitidus, pronoti lateribus, pedibus, antennis corporeque subtus fusco-rufis; latissimus, convexus, subglobosus, capitis medio parce, lateribus paulo crebrius, minute punctatis, margine antico recto; pronoto lævissime vix perspicue punctato, lateribus valde dilatatis, supra paulo convexis, subtus excavatis, marginibus lateralibus fortiter rotundatis, angulis anticis productis, obtusis, posticis nullis, basi fere recto, scutello lævi, medio sulcato; elytris profunde punctato-striatis, striis antice abbreviatis, sex dorsalibus geminatis, intervallis latis, lævibus; corpore subtus minus nitido, subtiliter transversim strigoso; tibiis anticis extus serratis, tridentatis.

Long. 6–7 mm.; lat. 5 mm.

New Guinea: Mamberamo River, Pionierbivak (*W. C.* *leurn*, Dec.–Jan., July–Aug.); Kani Mts. (*Bennigsen*).
n the British Museum and Berlin Entomological Institute.
he New Guinea species of *Liparochrus* previously described
remarkable for their large size. The present one is
or than any of them, and has a closer relationship with

the Australian representatives of the genus. It resembles *L. geminatus*, Westw., but is still broader in shape and more smooth and shining. The pronotum is less convex, more dilated at the sides, and extremely glossy. The elytra are as broad conjointly as they are long, with the striæ not nearly reaching the base and the intervals entirely smooth.

Genus PHÆOCHRIDIUS.

Phæochridius uniformis, sp. n.

Totus ferrugineus, leviter nitidus, pyriformis, alte convexus, capite pronotoque crebre sat fortiter punctatis, clypeo fere semicirculari, pronoti angulis anticis acutis, posticis nullis; elytris crebre et fortiter punctatis, ♂ punctorum seriebus 4 duplicis longitudinaliter ordinatis, ♀ punctis omnino longitudinaliter ordinatis, utriusque sexus seriebus postice obliteratis, apicibus minute excisis, angulis suturalibus brevissime spinosis; tibiis anticis robustis, extus serratis, dentibus tribus validis.

Long. 7 mm.; lat. 5 mm.

N. BORNEO: Kina Balu.

In the British Museum and Berlin Entomological Institute.

I pointed out in Trans. Ent. Soc. Lond. 1909, p. 488, that a smooth unpunctured space upon the elytra in the two known species of this genus (both Sumatran) was a feature of the female sex. In the Bornean species described above this peculiarity is not found, but it is replaced by another sexual characteristic. The elytra of the male are very closely and uniformly punctured, and amongst the punctures there are four pairs of closely approximated longitudinal series placed at wide and equal intervals—one pair originating at the humeral prominence, two interior to it, and one exterior—and all vanishing before reaching the apex. In addition, there is a single juxta-sutural series. In the female all the punctures are arranged in regular longitudinal rows, except towards the extremities. The head and pronotum are closely and evenly punctured in both sexes, exactly as in the two Sumatran forms. The front tibiæ are stouter than those of *P. haroldi* (I have not seen *P. derasus*) and bear three very strong sharp teeth, the uppermost placed about halfway between the two extremities and farther back than *P. haroldi*.

This is a convenient opportunity for referring to the ge
GYMNORHOPTERUS. This genus was formulated by Dr. G
in 1899 for a Bornean insect referred to the Trogide

Lansberge in 1887 under the name of *Synarmostes striatulus*. Dr. Gestro found that the insect had no place in the genus *Synarmostes*, but, the specimen being unique, he was only able to make a superficial examination of it. Although the matter can only be set at rest by a careful investigation of the type in M. René Oberthür's collection, it seems to me very probable that the insect will be found not to be a Lamellicorne at all, but to belong to the Hydrophilidæ, and perhaps to the genus *Globaria*.

XXXVI.—*Spiders collected by the Shackleton-Rowett Expedition in the Island of Madeira.* By W. S. Bristowe, B.A., Caius College, Cambridge.

(From the Zoological Laboratory, Cambridge.)

In Arctic regions spiders are surprisingly numerous, and, as an example, about sixty species have been recorded from Greenland alone; but in the Antarctic, on the other hand, they appear to be very poorly represented. This scarcity is perhaps responsible for the fact that none were collected in the Antarctic by the recent Shackleton-Rowett Expedition, and, indeed, it was only on the way home in October 1921, when the Expedition touched at the island of Madeira, that any spiders were collected. The collection, which was made by Mr. G. H. Wilkins, has been placed in my hands through the courtesy of Mr. S. Hirst, of the British Museum of Natural History, South Kensington. Though the collection is a small one, it is of considerable interest, for it includes three of the species peculiar to the island, one of which—a male—has previously only been found in the female sex.

It is not in the scope of this paper to argue as to whether Madeira is a remnant of the mythical Atlantis, but, if it was ever joined to the mainland of Africa, a long period must have elapsed since severance took place. This is testified to by the extremely deep channel which now separates Madeira from the mainland, by the absence of mammals (apart from bats and a few imported species), and the large number of endemic species of insects and spiders. Opinions differ as to the origin of the island, but late Tertiary is said by some experts to be the period when it was formed by a gradual upheaval of the ocean-bed, and by others as the period when it became disconnected from the African coast. If we assume the first of these views, we must look to the various methods of dispersal to explain the present fauna of the island. If we believe in the second theory (which is, perhaps, the most popular one), the fauna of Madeira to-day should have affinities with the fauna which existed on the mainland, from which it was severed, at the time of severance. An investigation into the distribution of the spiders shows us that very little affinity exists with those of the adjacent mainland, but that the majority of the species are to be found to-day further north round the Mediterranean. If Madeira became cut off from the mainland, therefore, a more temperate climate must have existed in Africa at that time than there is to-day, and fossil evidence shows that this was the case.

Madeira has been a centre of commerce for such a long period that it would be strange if a portion of the fauna and flora did not owe its presence in the island to human agencies. That almost world-wide species *Theridion tepidariorum*, C. L. K., is now well-established in houses in Madeira. *Pholcus phalangioides*, Fuess., found in similar situations, is probably another imported species. The house-spider (*Tegenaria parie[illegible]a*, Fourcr.) is a third example. In a recent note on the spiders of Madeira* Mr. T. D. A. Cockerell points to *Epeira crucifera*, Luc., as being a recent import, on the grounds that it was not included by Mr. C. Warburton in 1892 in his list of the known spiders of Madeira†. This, however, is not correct, for it did occur in that list, and has been included in many earlier lists, under the name of *Epeira lentiginosa*, Bl. The body-markings of this species are very variable, and the genital organs, which are figured by Kulczynski ‡, are the most reliable means of identifying it. In the same valuable paper Kulczynski gives figures, amongst others, of *Chiracanthium albidulum*, Bl., *Misumena spinifera*, Bl., and *Theridion barreti*, Kulcz., the three endemic species included in the present collection made by Mr. Wilkins. In describing *Theridion barreti* Kulczynski only had female specimens. Mr. Wilkins has obtained one specimen of each sex, and the male is here described for the first time. The genus *Theridion* is a very large one, and some day it may be found necessary to split it up, as has been attempted in the past (*Phyllonetis*, *Coleosoma*, etc.).

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* 'Nature,' July 5th, 1924, vol. cxiv. p. 11.

† Ann. & Mag. Nat. Hist. vol. x. (Sept. 1892) p. 216.

‡ Rozprawy Akad. Umiejet. Krakow, vol. xvi. 1899, p. 369.

Theridion barreti, Kulcz. (Figs. 1–4.)

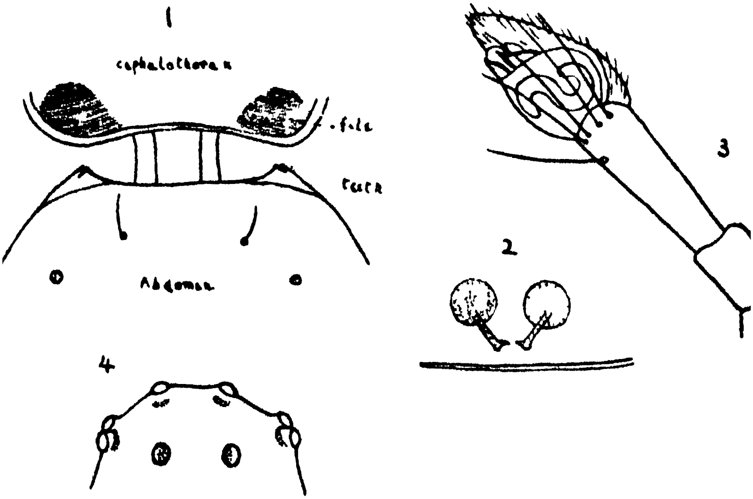
Kulczynski, Rozprawy Akad Umiejet Krakow, vol. xvi p 369 (1899).

Description of Male.

Size.—Total length 2·5 mm.

Colour.—Light yellow. Only slightly darker than ♀. Two lines of indistinct black spots running down abdomen, each line consisting of three spots.

Eyes.—Small. About equal in size. Anterior line recurved, posterior line slightly procurved. Lateral eyes contiguous. Front median eyes about the same distance apart as hind median eyes, or slightly closer together. Spacing of eyes in both anterior and posterior lines of eyes about equal.



Theridion barreti, Kulcz.

1. Stridulating apparatus of the male 2. ♀ epigyne 3. ♂ palp.
4. Arrangement of eyes.

Sternum.—Slightly convex. Longer than broad.

Legs.—Moderately long and slender. Coxæ of first pair longer than coxæ of fourth. Tarsal claws very small and pectinate.

Palpi.—Palpal organ small and simple. Four or five long bristles near anterior end of tibia, which is twice as long as patella.

Falces.—Simple.

Abdomen.—Slightly longer than broad. Ovate. Broader in front.

Stridulating-organ.—Teeth situated on each side of anterior portions of abdomen, with a corresponding " file " on each side of posterior portions of cephalothorax.

List of Spiders in the Collection.

Misumena spinifera, Bl. (*M. clarkii*, Warb.)
Pisaura mirabilis, Clerck.
Chiracanthium albidulum, Bl. (*C. faureli*, Sim.).
Tegenaria parietina, Fourcr. (*T. guyonii*, Guér.).
Theridion rufipes, Luc. (*T. luteolum*, Bl.).
—— *barreti*, Kulcz.
Lithyphantes nobilis, Th.
Argiope bruennichii, Scop.
—— *trifasciata*, Forsk. (*A. aurelia*, Sav. et Aud.).
Cyrtophora citricola, Forsk., immature ♀.
Epeira crucifera, Luc. (*E. lentiginosa*, Bl.)
Zilla x-notata, Clerck.
Meta merianæ, Scop., immature ♀
Xysticus sp.
Clubiona sp.
Leptyphantes sp. } Too young to be determinable
Lycosa sp.
Tegenaria sp.

XXXVII.—*New and little-known Species of Neuroptera in British Collections.* By P. Esben-Petersen, Silkeborg, Denmark.

[Plate XX.]

By the kindness of the Director, Dr. Guy A. K. Marshall, I have had the pleasure of looking over some Neuroptera belonging to the Imperial Bureau of Entomology. Below I give descriptions of a few new genera and species, together with some notes about a few interesting little-known genera and species.

TRICHOLEON, gen. nov.

Slender. Antennæ long, strongly clavate. Prothorax longer than broad. Abdomen wanting. Legs long, slender, and strongly haired. Femora and tibiæ of equal length; tarsi half the length of tibiæ. First tarsal joint almost as long as second and third joint united; second joint longer than third; fourth very short; fifth and first joint of almost equal length. Spurs straight, as long as first tarsal joint. Claws long and straight. In fore wing *Rs* arises before cubital fork Three to five cross-veins before origin of *Rs*. Basal free part of Cu_2 long. *2A* and *3A* free; both veins forked. Cu_2 long, sinuate. Anterior Banksian line indicated. A few cross-veins in apical area. Costal area rather broad, especially towards apex; several costal cross-veins forked. In hind wing one or two cross-veins before origin of *Rs*. Costal area rather broad; several costal cross-veins forked. Apical area with some cross-veins. Anterior Banksian line indicated. Hind wing and fore wing of equal length. In the male sex a pilula at base of hind wing. All veins of the wings strongly haired.

This genus is closest allied to the Australian *Glenoleon*, Banks, but it differs as to the long and forked *2A* in the fore wing and with regard to the shorter spurs.

Genotype is the below-described species.

Tricholeon hirtellus, sp. n. (Pl. XX. fig. 1.)

Head whitish grey; a dark band between antennæ. Vertex rather raised; three black spots forming a transverse streak; behind this streak one or two black spots. Antennæ whitish grey, blackish annulated; basal joint black dorsally; club blackish. Prothorax whitish grey, narrowed in front and with rounded front angles; transverse furrow very distinct laterally. Dorsum indistinctly marked; a fine longitudinal median black line, only indicated in front and at the posterior margin; a curved blackish streak indicated near front angle, and a short blackish streak at each side posteriorly. Meso- and metathorax with blackish streaks and spots. Underside of thorax whitish with a jet-black streak at each side. First, second, and third abdominal segments (the other segments wanting) whitish; dorsum of second and third segments with a broad dark band posteriorly. Legs yellowish white, with numerous dark dots; a black band at tip of femora and tibiæ; fore and intermediate tibiæ with two indistinct black bands on basal half. Body and legs haired. Venation whitish. All the longitudinal veins with black streaks. Cross-veins either totally black, or totally whitish, or partly blackish and whitish. Pterostigma indistinct; yellowish.

Fore wing, ♂, 26 mm.; hind wing, ♂, 26 mm.
,, ♀, 29·5 ,, ,, ♀, 29·5 ,,

1 ♂, Keurboom River, 8. i. 1922; 1 ♀, Keurboom River, 19. i. 1922 (*Chas. K. Brain* leg.). British Museum.

BRACHYPLECTRON, gen. nov.

Antennæ strongly clavate. Prothorax a little longer than broad. Abdomen shorter than hind wings. Legs moderate. Femora and tibiæ of equal length. Hind tarsi as long as tibiæ; fore and intermediate tarsi a little longer than tibiæ. First tarsal joint somewhat shorter than second, third, and fourth joints united; fifth joint longer than first. Spurs shorter than first tarsal joint; of hind legs almost as long as first tarsal joint. Wings rather long and slender, acute at tip. In fore wing *Rs* arises beyond fork of Cu_1; seven cross-veins before origin of *Rs*. Cu_{1a} and Cu_{1p} forming a rather acute angle. Free and basal part of Cu_2 distinct; one cross-vein between that part and Cu_1. *2A* and *3A* coalesce for a short distance; both veins forked at their tip. Some few cross-veins in the posterior basal part of the fore wing. Anterior and posterior Banksian line indicated Apical area with a series of cross-veins. In hind wing one cross-vein before origin of *Rs*. No Banksian lines present. Apical area with a series of cross-veins.

This genus is nearly allied to the Australian genus *Stenoleon*, Till., but in the last-named genus no Banksian lines are indicated in the fore wing and no cross-veins are present in the apical area of the wings. A peculiar feature in the new genus is the presence of a number of cross-veins in the posterior basal part of the fore wing. *Brachyplectron* has to be placed in the Formicaleonini, near the genus *Nelees*.

Genotype is the below-described species.

Brachyplectron capense, sp. n. (Pl. XX. fig. 2.)

Face below the antennæ jet-black, shining. Clypeus, labrum, and palpi castaneous, shining. Vertex raised, dull black. Antennæ blackish, with paler annulations, the club flattened. Thorax blackish, with indistinct bluish markings (the specimen is strongly matured). Abdomen blackish. Legs dark brown; tibiæ paler and with black band at apex and near base. First and fifth tarsal joints paler at base. Venation blackish and with whitish annulations.

Fore wing 25 mm.; hind wing 22·5 mm.

1 ♀, Stellenbosch, 17. ii. 1921 (*Chas. K. Brain* leg.). British Museum.

OBUS, Navas.

Broteria, Zoologica, vol. x. p. 59 (1912).

Antennæ short, strongly clavate. Prothorax broader than long. Abdomen (♀) shorter than hind wing. Legs moderate. Tibiæ a little shorter than femora. Tarsi—at least fore tarsi—longer than tibiæ. Fifth tarsal joint of fore and intermediate legs longer than first tarsal joint; fifth tarsal joint of hind leg as long as first tarsal joint. Second, third, and fourth joints short. Spurs very short, much shorter than first tarsal joint. Basal free part of Cu_2 in fore wing very short. $2A$ and $3A$ coalesce for a short distance. $2A$ rather long; $3A$ also rather long, but branched several times. In hind wing M_{2a} and M_{2p} are running parallel to each other and to Cu_1. Apical area in both pairs of wings with cross-veins.

This genus is a very interesting one and has to be placed in the Creoleonini; but it occupies a peculiar position, on account of the peculiar venational characters in the hind wing, quite unknown in the other genera of the Neomyrmeleonida.

Type: *Obus elizabethæ*, Banks, Ann. Ent. Soc. Am. iv. p. 13 (1911). (Pl. XX. fig. 3.)

Syn. *Obus arenosus*, Navas, Broteria, x. p. 60 (1912) (British Museum); Ann. Soc. scient. Bruxelles, p. 240 (1914).

1 ♀, Stellenbosch, 6. iii. 1921 (*Chas. K. Brain* leg.). British Museum.

Macronemurus chloranthe, Banks.

Ann. Ent. Soc. Amer. iv. p. 23 (1911).

1 ♀, Keurboom River, 5. i. 1922 (*Chas. K. Brain* leg.). British Museum.

This species should be placed in the genus *Nelees*. The free basal part of Cu_2 in the fore wing is rather long and connected to Cu_1 by a cross-vein; in *Macronemurus* this part of Cu_2 is formed like a short oblique cross-vein. In *Macr. chloranthe* the spurs of fore and intermediate legs are a little longer than first and second tarsal joints united, of hind legs a little longer than first tarsal joint.

Myrmeleon obscurus, Rbr., forma *capense*, Rbr.

2 ♀, Keurboom River, 15–17. i. 1922 (*Chas. K. Brain* leg.).

The two specimens agree with the description of *capense*, given by Rambur, and also with the photo of the type-specimen in Coll. Selys; but the species can hardly be considered only as a geographical form of the widespread

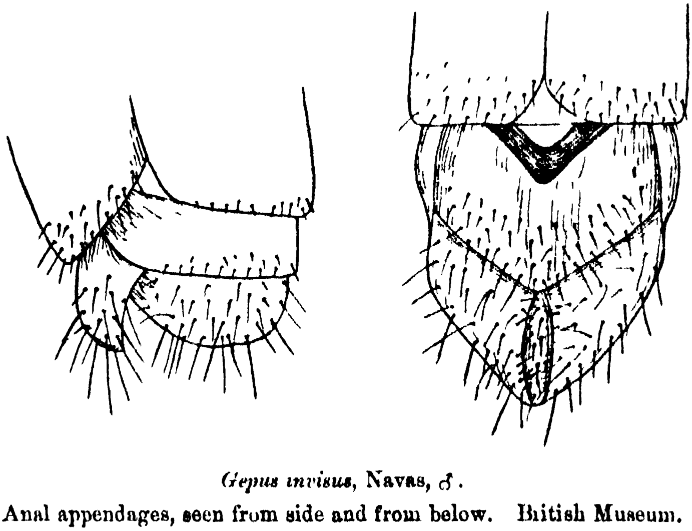
Myrmeleon obscurus. The specimens of *capense* seem to be somewhat larger than those of the typical form. The area between Cu_{1a} and the posterior Banksian line contains basally six to seven cells in a single row; in the apical part of the area two and one cells alternate.

I believe that the species *Myrmeleon fusiformis*, described by me in Entom. Mitteil. Bd. i. p. 268, fig 2 (1912), is *Myrm. obscurus*, Rbr. The description was made from an immature specimen, found at Swakopmund, and placed in Deutsch. Entom. Museum, Berlin.

Gepus invisus, Navas. (Text-fig.)

1 ♂, Min. Agr. Egypt. Sagâra, 30. vii 1915. British Museum.

On account of the uncertainty with regard to the determination of the species within the genus *Gepus*, I give here some remarks concerning the above-named species.



Gepus invisus, Navas, ♂.
Anal appendages, seen from side and from below. British Museum.

Face yellowish. Antennæ brown, yellowish annulate; club distinct, but flattened. Palpi yellowish; apical joint of labial palpi pointed, blackish-haired and with a blackish streak exteriorly. Above and between base of antennæ dark, indistinctly indicated markings. Vertex raised, with two transversely placed rows of black spots. Prothorax much broader than long. Thorax testaceous with interrupted blackish streaks. Mesoscutellum much raised, with five small black dots. Abdomen testaceous, above and below irregularly marked with black streaks and spots. Legs yellowish. Femora dark on upperside. Fore and middle tibiæ with three dark bands, hind tibiæ with a band at apex. Tarsal joints with black apex. Spurs as long as first tarsal joint; of hind legs not so long as first joint. First tarsal joint almost as long as second and third united; fifth joint almost as long as first to fourth united. Wings without markings. Pilula present in the male sex.

Fore wing 29 mm.; hind wing 25 mm.; body 27 mm.

Myrmeleon linearis, Klug.

Symbolæ physicæ, etc., pl. xxxvi fig. 1 (1834): Syria.

2 ♀, Haifa, Palestine, 20. v. 20 (*P. J. Barraud* leg.). British Museum.

This species must be placed in the genus *Macronemurus*.

As most of Klug's species of Myrmeleonidæ, described in his 'Symbolæ, etc.,' often have been misunderstood or misinterpreted, and as I possess photos of all his type-specimens, I should like to give a few notes about some of them:—

Myrmeleon variegatus, Klug, Symbolæ, pl. xxxv. fig. 4, from Arabia, is *Nesoleon variegatus* as determined by Banks (Ann. Ent. Soc. Amer. iv. p. 8, 1911). I possess specimens from Abyssinia.

Myrmeleon gracilis, Klug, Symbolæ, pl. xxxv. fig. 5, from Syria, has not yet been rediscovered. The species must be placed in the Creoleonini. In fore wing *Rs* arises further out than cubital fork. Basal free part of Cu_2 in fore wing rather long. *2A* and *3A* coalesce for a short distance, and both veins are forked. Apical area with cross-veins. Costal area very narrow. The three dark spots touching *R* in the fore wing are very conspicuous.

Myrmeleon irroratus, Klug, Symbolæ, pl. xxxv. fig. 6, from Saccahram and Arabia, is a *Creoleon*. I have seen the species from Amara (see Morton) and from Egyptian Sudan. I can give the following citations concerning the species:

Creoleon irroratus, Navas, Revista Zaragoza, p. 304 (1919): Tunis, Mauritania.
Creagris irroratus, Morton, Ent. Mo. Mag. p. 216 (1921): Amara.
Creagris cinerascens, Navas, Broteria, p. 59 (1912): Somaliland Banks, Journ. N.Y. Ent. Soc. pl. ii. fig. 9, p. 153 (1913).

Myrmeleon tenellus, Klug, Symbolæ, pl. xxxv. fig. 7, from Siut et Kuch, Dongala, and Arabia, is a *Neuroleon*, and I am much inclined to consider *Neuroleon arenarius*, Navas, as the same species. With regard to the shape of the wings and the venation, specimens of *Neuroleon arenarius* agree exactly with the photo of the type-specimen of *tenellus*. I think that Schneider (Stett. ent. Zeit. p. 312, 1845) is right in referring two specimens from Messina to that species.

Myrmeleon virgatus, Klug, Symbolæ, pl. xxxvi. fig. 2, from Arabia, is a *Nesoleon*, but distinctly separable from *Nesoleon variegatus*, Banks (Journ. N. York Ent. Soc. xxxi. p. 155, 1913).

Nesoleon virgatus: Fore wings unmarked. Posterior Banksian line in both pairs of wings rather indistinctly indicated. The arrangement of cells between Cu_{1a} and posterior Banksian line in fore wing rather irregular. In fore wing ten cross-veins before origin of *Rs*, in hind wing nine cross-veins.

Nesoleon variegatus: Fore wing with a dark oblique streak arising from the end of Cu_{1p}; another runs apart from but parallel to the hind margin of the apical part of the wing. Several forks along hind margin dark. Posterior Banksian line in both pairs of wings very distinct. Arrangement of cells regular. In fore wing thirteen cross-veins before origin of *Rs*, in hind wing eleven cross-veins.

Myrmeleon cinereus, Klug, Symbolæ, pl. xxxvi. fig. 3, from Arabia, is the same as *Myrmeleon hyalinus*, Olivier (Encycl. Method. viii. p. 126), and *Myrmeleon distinguendus*, Rambur (Névroptères, p. 407, 1842). Olivier's name has the priority.

Myrmeleon lætus, Klug, Symbolæ, pl. xxxvi. fig. 4, from Arabia, is *Myrmecælurus lætus*, distinctly separable from *Myrmecælurus trigrammus*, Pall. In fore wing of *M. lætus* two regular rows of cells between Cu_{1a} and posterior Banksian line, in hind wing one row between M_{2a} and posterior Banksian line. $2A$ and $3A$ in fore wing not coalescing, but connected with each other by a cross-vein. Banks (Journ. N. York Ent. Soc. p. 154, 1913) cites *Myrmecælurus lobatus* as synonymous with Klug's species.

Myrmeleon murinus, Klug, Symbolæ, pl. xxxvi. fig. 5, from

Syria, is undoubtedly the same as *Creoleon plumbeus*, Olivier (Encycl. Method. viii. p. 126).

Myrmeleon pallens, Klug, Symbolæ, pl. xxxvi. fig. 6, from Fajun, is *Nesoleon pallens*, as Banks (Ann. Ent. Soc. Amer. iv. p. 8, 1911) has already pointed out. The species is known from several localities in Africa.

Myrmeleon annulatus, Klug, Symbolæ, pl. xxxvi. fig. 7, is *Formicaleo annulatus*, Klug, a scarce but rather widespread species.

Myrmeleon griseus, Klug, Symbolæ, pl. xxxvi. fig. 8, from Benisuef, Dongola, Fajun, and Egypt, seems to be closely allied to *Creoleon plumbeus*, and is probably the same.

Myrmeleon lepidus, Klug, Symbolæ, pl. xxxvi. fig. 9, from Cahiram and Benisuef is *Nesoleon lepidus* as stated by Banks (Journ. N. York Ent. Soc. xxi. p. 156, 1913). I possess specimens of the species from Sahara.

EXPLANATION OF PLATE XX.

Fig. 1. *Tricholeon hirtellus*, gen. et sp. n., ♀. British Museum.
Fig. 2. *Brachyplectron capense*, gen. et sp. n., ♀. British Museum.
Fig. 3. *Obus elizabethæ*, Banks, ♀. British Museum.

XXXVIII.—*Ancestrulæ of Cheilostomatous Bryozoa.*—Part II. By Arthur Wm. Waters, F.L.S., F.G.S.

[Plates XXI. & XXII.]

New Species :—

Monoporella tahitiensis, nov., p. 342.

Previously described :—

Membranipora membranacea, L., p. 343.
Chaperia judex, Kirkpatrick. (Pl. XXI. fig. 9, see "Ancest. *M. pilosa*," p. 608, pt. 1.)
Haplopoma impressum, Aud., p. 345.
—— ——, var. *multiporum*, nov., p. 346.
—— *bimucronatum*, Moll., p. 345.
Chorizopora brongniartii, Aud., p. 346.
Micropora coriacea, Esper, p. 349.
Rosseliana patellaria, Moll., p. 347.
—— ——, var. *multijuncta*, Waters, p. 347.
Setosella vulnerata, Busk, p. 349.
Setosellina roulei, Calvet (1) *, p. 350.

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* (1) indicates that only one specimen with ancestrula has been seen.

Micropora uncinata, Busk (1), p. 850.
Microporella diadema, MacG. (1), p. 352. (Pl. XXI. fig. 10, see "Ancest. *M. pilosa*," p. 600, pt. 1.)
Cribrilina patagonica, Waters (1), p. 350.
Mucronella præstans, H. (Pl. XXII. fig. 4.)
Rhamphostomella scabra, Fab. (Pl. XXII. fig. 3.)
Cellepora avicularis, Hincks (1). (Pl. XXII. fig. 5.)
Lagenipora caminata, Waters, p. 351.

In my introductory communication *, I showed that the general rule is for the incrusting Cheilostomata to have, distal to the ancestrula, three zoœcia; from these may grow zoœcia directed proximally with much more irregularity, and they may or may not be attached directly to the ancestrula. I shall follow the plan of being satisfied with using recognisable names, as many changes may still take place, and it is hoped that the line of investigation now indicated will give some assistance in making the classification more natural. I had hoped to have reached more of the species with the ancestrulæ not differing from the other zoœcia, but this must be left for future papers, and when we deal with them progress will be more rapid, as it will often only be necessary to state the fact and few figures will be required.

As Barrois stated that the species he put under the genus *Mollia*, Lamx., have an embryo differing from other groups, special attention has been given to them, but probably there are many others to be placed here, and "il va sans dire" that the embryologists should examine as many species as possible of anything that may be related to those now known.

The ancestrulæ indicate clearly that there are three species of *Haplopoma*, in which genus there are other characters supporting the division, about which there has been much uncertainty (see p. 345).

Although the examination of the ancestrula is the most important at present, yet the growing end should be more carefully examined, as points of importance may be discovered.

Monoporella tahitiensis, sp. n. (Pl. XXII. figs. 1 & 2.)

This has the shape and characters of *Monoporella* as represented by *M. nodulifera*, Hincks, though without the nodules. Under *Monoporella* Hincks placed *nodulifera* and

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* "The Ancestrula of *Membranipora pilosa*, L.," Ann. & Mag. Nat. Hist. ser. 9, vol. xiv. p. 594 (1924).

M. lepida, but we cannot consider the last as belonging here. The genus is described by Hincks * as "zoœcia destitute of a membranous area or aperture, and of raised margins; orifice arched above with the lower lip entire." At that time certain fossils with somewhat of a Microporidian facies, without a median pore or opesiules, were wanting a home, and some that I placed here are not now considered to belong to the genus.

The "depressed area" is larger than in *M. nodulifera*, Hincks, the walls are thick, and the thick lateral part looks more like a margin than in Hincks's species. *M. tahitiensis* is surrounded by a wonderful array of bifurcate and cervicorne spines, about 20–25. There are somewhat similar spines on *Lepralia filamentosa*, Kirkpatrick †, from Torres Straits. The operculum fits into the calcareous opening, and also closes the ovicell, which is plain and short, only moderately raised. The zoœcium (*b*), which is near the growing edge, has had the spines and membranes weathered away—however, the pores on the border show the bases of about 20 spines; and on the side-wall there are two or three rows of large pores, apparently leading into chambers.

The ancestrula is similar to the other zoœcia, but smaller, with apparently but few small spines, but most of the spines of this part have fallen out, and it is difficult to know what there has been in the ancestrular part—some are represented in Pl. XXII. fig. 2, to show that there are spines, without all having been seen exactly in the position drawn.

Loc. Tahiti, sent to me by Miss E. C. Jelly.

Membranipora membranacea, L. (Pl. XXI. fig. 1.)

The double ancestrula (fig. 1) is very similar to that of *M. villosa*, Hincks, and the variety I figured in my last paper (pl. xviii. figs. 10, 11). There are on the lower outer border four stout protuberances, from the top of which there is a short minute membranous tube, and a similar tube may be found on the "stout hollow spine" at each corner, so this is another case of finding zoœcial characters shown in the ancestrula.

There is frequently a spine or process at the angle, in what I called the *membranacea* group, and we may call these angle-spines chitinous, though often there is a fair amount of calcareous deposit. In *M. lacroixii* there is in this position a small chamber and in other species there is an avicularium. The clear spot I mentioned on the dorsal aspect of *M. lacroixii* has not been explained, but now I find that it is the base of the interzoœcial chamber, and in the avicularia of some species there is a similar mark; possibly it should be compared with the clear area at the base of so many Cheilostomata.

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* *Haplopoorella nodulifera*, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 58 (1881); name afterwards changed by Hincks to *Monoporella*.

† Proc. Roy. Dublin Soc. n.s. vol. vi. pl. xvi. fig. 5 (1890).

M. membranacea has no pore-chambers, which are common in the *M. lineata* group—perhaps not a very important character.

There is a very important structure in *M. membranacea*, the function of which remains a mystery, for the "Thurm-zoœcia" of Nitsche occur sometimes in great abundance; for a long time I had never seen any, and on nearly all the *membranacea* that has come under my observation there has been none, but seaweed thrown up at Penmaenmawr and Conway, Wales, has them in great abundance. Until I saw these I was inclined to think that some mistake had been made. They are broad tubes rising directly from the front of the zoœcium, apparently without any basal wall and about three times the length of a zoœcium. The younger ones end in a peak, but the older ones have a more or less flat distal end with a round mark. I have one full of very small grains of sand, and have seen several containing sand-grains.

It is interesting to see that the cervicorne spines on *Flustra stolonifera*, Okada[*], grow from the front of the zoœcium, just as the "Thurm-zoœcia" grow from *M. membranacea*. The "Thurm-zoœcia" and the embryos of the group should be studied by some of our younger zoologists; for me it is now an impossibility.

In my last paper I mentioned that Norman had somewhat forestalled me in thinking that *M. membranacea* was not closely related to most of the species placed under *Membranipora*, and Smitt[†] speaking of *Alcyonidium corniculatum*, Sm., says it and *A. hispidum* seem on the way of transition to the Cheilostomatous structure, and that the very characteristic spines bring them both near to the genus *Flustra*, though they must remain with Ctenostomata.

Hippothoa-Haplopoma *Group of Barrois.*

Barrois found that species which he placed under *Mollia* had an embryo materially different from that of any other

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[*] "Notes on some Japanese Cheil. Bry.," Annot. Zool. Jap. p. 20, vol. x. pl. iii. (1921).

[†] Krit fört öf Skand. Hafs B, no. 3, p. 1124 (1871).

Cheilostomata, and it is of the greatest importance that the group should be carefully studied, including the embryos of any species which may be allied.

For Barrois, *Mollia* was *Hippothoa hyalina* and *Haplopoma impressum* or *graniferum*, B.; for Smitt, several species of *Schizoporella* and *Hippothoa* at first formed *Mollia*, without any consideration of the special character mentioned by Lamouroux; afterwards, in his Florida paper, Smitt included *Onychocella*, *Membranipora holostoma*, Busk, *M. oceani*, B., *Steganoporella elegans*, M.-Ed.—in fact, he made it very much the same as the Opesiulidæ of Jullien.

Norman *, however, wished to revive the genus *Mollia*, Lamx., for *R. patellaria*, Moll., but the only point, of the least importance, in the suggestion of Lamouroux † is "cellules presque pédicellées," but Norman thought, if he could recognise the first species of a list, this was a reason for reviving a generic name, whether there was a sufficient description or not, and this has led to much inconvenience; though in this case no generic description even was ever given, the suggestion of Lamouroux was that *Eschara patellaria*, Moll., and *E. planata*, Moll., might form a new genus *Mollia*, but none of the species mentioned by Barrois or Smitt belong to this genus.

To take *Haplopoma*, the ancestrulæ indicate that there are three species: first, the common Mediterranean form with pores regularly and generally distributed over the front of the zoœcium, which has usually been taken as *H. impressum*, Aud. The ancestrula has few pores near the border and some smaller ones down the median line (Pl. XXII. fig. 12) and a small narrow sinus in the oral aperture.

Closely allied is the ancestrula of *H. bimucronatum*, Moll., but here there are a small number of larger pores within an area (Pl. XXII. fig. 13), and, what is a matter of much surprise, there is in two cases an ascopore, as well as the sinus, but in other specimens this does not occur. There are few pores on the surface of the ordinary zoœcium, and they and the ascopore are stellate.

Next, *H. graniferum*, Busk. A specimen sent to me so named by Miss Gatty, from an unknown locality, but probably British, has a smooth ancestrula without pores and its aperture has a wide poster, instead of the narrow sinus of the first-named form. The ancestrula has been figured by Levinsen* as *H. impressum* (in plate *cornuta*). In both *H. impressum* as figured by Savigny and *H. graniferum*, Busk, there are a few pores round the edge. I have this form from Capri and Villefranche-sur-Mer, but most species in the Mediterranean are the first alluded to, which it therefore seems must be distinguished in some way, so perhaps the safest thing would be to call it provisionally *H. impressum*, var. *multipora*, nom. nov., and *graniferum* must be considered as a synonym of *impressum*. The ordinary zoœcia of all *Haplopoma* have an oral aperture with a straight proximal edge and all have pore-chambers. Jullien and Calvet speak as if all the Mediterranean specimens were *bimucronatum*, but the three forms occur in the Mediterranean.

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* "Poly. of Madeira," etc., Journ. Linn. Soc., Zool. vol. xxx. p. 286 (1909).

† Hist. Polypiers Coralligènes, p. 115 (1816).

Chorizopora brongniartii, Aud. (Pl. XXII. figs. 9, 11, 14), must be further considered in its relationship to the *Mollia* group. We have seen that the zoœcia are connected by tubes and that there are chambers between the zoœcia, some with a small round mark, while others may be avicularian. The ancestrula is similar to the ordinary zoœcia, and is closed by a calcareous front wall and its oral aperture has a straight lower edge (Pl. XXII. fig. 7). The ovicell is smooth and imperforate, as is the case in *R. patellaria*, but there is a tendency to a keel; and the frontal surface of the zoœcium has always been figured as smooth and imperforate, but in some material remaining, after using Eau de Javelle, specimens showed a line of very small pores, running from close to the oral aperture parallel to the border (Pl. XXII. fig. 9). Having found them in this prepared material, others were examined, and, though not readily seen, the same thing was found in specimens from Naples, Santa Margherita, Villefranche-sur-Mer, Cape Verde Islands, and Plymouth, and they are mentioned by Friedl from the Adriatic, who made a variety in consequence, whereas no doubt it is general.

To me it seems this row of pores may have an important significance, as we find on the ancestrula of *Haplopoma impressum*, var. *multiporum*, a very similar row of pores, and in *C. vittata*, Busk, there is, besides such a row, also vittæ between them; however, the ancestrulæ of *R. patellaria* and *Chorizopora* are quite different from those of *Haplopoma*. In the group under consideration we see how important, often perhaps decisive, the ancestrula are for specific distinctions; but for generic and other divisions we seem to make progress but slowly. However, the ancestrulæ have a calcareous cover, and in most there are no ancestrular spines.

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* (Studies), p. 280, pl. xxii. fig. 9.

C. brongniartii and *Haplopoma* have pore-chambers, and so has *Tryposteya venusta*, which Levinsen considers belong to the *Mollia* group, but it has an entirely differently-shaped oral aperture. *R. patellaria* has no pore-chambers.

The growing end of *C. brongniartii* shows numerous budding growths starting from the border, and these join together to form the neighbouring zoœcia, as seen in Pl. XXII. fig. 6, from a decalcified stained preparation, and in the same way in *Beania magellanica*, B., the tube-growths join to form fresh zoœcia, as seen in my figure* of a Naples specimen, and there are other cases with a similar growth, whereas it is more common for the zoœcial walls to be formed in advance by parallel divisional lines the length of several zoœcia ahead of the polypides; then this is gradually divided off into quadrangular spaces, as is shown by Nitsche in *M. membranacea*, and this growth occurs in *Schizoporella auriculata*, *S. unicornis*, and a large number of their allies.

Rosseliana patellaria, Moll. (Pl. XXI. figs. 6, 7, 8.)

Eschara patellaria, Moll., "Die Seerinde," p. 75, pl. iv. p. 20 (1803).
Diachoris simplex, Heller, "Bry. Adriat. Meeres," Verh. k. k. zool.-bot. Gesell. vol. xvii. p. 94, pl. i. fig. 4 (1867).
Flustra patellaria, Lamouroux, Hist. des Polyp. Corall. p. 115 (1816).
Mollia patellaria, Smitt, "Floridan Bry.," p. 12, pl. ii. fig. 72 (1873); Norman, "Poly. of Madeira," Journ. Linn. Soc., Zool. vol. xxx. p. 286 (1909).
Diachoris patellaria, Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 120, pl. x. figs. 6–9 (1879).
Membranipora patellaria, Waters, "N. Ital. Bry.," Q. Journ. Geol. Soc. vol. xlvii. p. 13 (1891); Calvet, "Exp. Sc. 'Travailleur' et du 'Talisman,'" p. 387 (1907).

This is partly dealt with under the group *Mollia* of Barrois (see p. 345). When prepared in Eau de Javelle, the trifoliate shape of the opesium is clearly shown, and this was appreciated by MacGillivray, who also considered that it was related to *R. rosselii*, Aud. But, although the trifoliate shape is usual, it is curious to find that the opesia of the ovicelligerous zoœcia do not show this at all, the side of the opening being straight, and this seems to indicate that the trifoliate shape, frequent in many forms allied to *Membranipora*, is not as important as frequently supposed; further, in *R. patellaria*, var. *multijuncta*, W.†, there is usually no trifoliate opening. The form of the zoœcia and the general structure is similar, in the type with only six connecting tubes, and in var. *multijuncta*, with about double as many, and the zoœcia much closer together. Possibly the *multijuncta* is the *E. planata* of Moll. (non Pergens), also it may be *M. mauritiana*, Kirkpatrick. It is an open question whether *patellaria* should be placed in the same family as *Haplopoma*, as is done by Levinsen. The ancestrula * of *multijuncta* has no spines and resembles the other zoœcia, but two or three rows close to the ancestrula may have 2–4 very minute spines, easily overlooked; the following zoœcia have no spines.

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* "Bry. of the Bay of Naples," Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 120, pl. xii. fig. 1 (1879).

† This is described as *Amphiblestrum* by MacGillivray, Prod. Zool. of Victoria, dec. xi. p. 70, pl. cxvii. fig. 9 (1886).

In Eau de Javelle preparations there are, round the dorsal surface, a row of calcareous tubes for the radicles, and it is on these Lamouroux † based the genus *Mollia*, as *patellaria* is described as "pédicellées," and somewhat similar radicles occur in *Schizoporella argentea*, Hincks, and *S. oligopus*, Robertson, but perhaps the most striking feature of *patellaria* is the tubular connection from zoœcium to zoœcium, which is also very marked in *Chorizopora brongniartii*, Aud. In *R. patellaria* there are also chambers between the zoœcia, joined to them by similar connections (Pl. XXI. fig. 7). Similar tubular connections occur in *M. circumclathrata*, Hincks, *M. acuta*, H., *M. pectinata*, MacG., *M. sejuncta*, MacG.

As stated, Norman and Smitt would place it under *Mollia*, Lamx., an undescribed genus only based on the radicles. *M. rosselii*, Aud., has similar opesial openings, and the ovicells are similar, and here and there I find, sometimes, but not often, radicles long and slender, as well as blind chambers, and so *patellaria* is left in *Rosseliana*, as *Mollia* is quite unsatisfactory and has been used for many things.

I followed Heller, then the authority on the Mediterranean Bryozoa, though with reservations, in placing *R. patellaria* under *Diachoris*, on account of the tube-like connections, just like those of *D. magellanica*, but this does not seem to be justified, any more than it was to call it *Membranipora*.

Loc. *R. patellaria* occurs from the Adriatic, Naples, Capri, Ajaccio, 280 met.; Nice, 40–100 met.; Bonifacio, 55–77 met.; Florida. Fossil: Montecchio, Maggiore, Ital. Tert. etc. The var. *multijuncta*, W., occurs from Naples, Capri, Taranto, Madeira, Cape Verde Islands (in my coll. and Calvet); Victoria, Australia, MacG., as *Amphiblestrum*.

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* *Floridina minima*, Canu & Bassler, has a very similar ancestrula.

† *Loc. cit.* p. 115.

Setosella vulnerata, Busk. (Pl. XXI. fig. 2.)

For synonyms, see Miss Jelly's Catalogue, and add: Calvet, "Exp. Sc. 'Travailleur' et du 'Talisman,'" p. 394 (1907).

The ancestrula has a trifoliate opening like that of the zooecia of *M. trifolium*. It is difficult to feel quite certain about the surrounding zooecia, for have the vibracular chambers to be counted with the zooecia? My present studies have caused me to modify my opinion as to the importance of the number of zooecia surrounding the zooecia; for the first three distal zooecia have usually a greater importance than the subsequent more irregular proximal ones. In *Cupularia canariensis*[*] and some *Selenaria* there are the usual three distal zooecia, and then five proximal ones. The early zooecia of *Cupularia* are very long, and this may account for the larger number of surrounding zooecia, the number eight seeming to be general in the genus.

The vibraculum is just distal to the zooecium, and the same is the case in *Setosellina roulei*, Calvet (Pl. XXI. fig. 4), which has a membranous front wall like *Membranipora* of the *lineata* group. The position is the same in *Heliodoma* and occurs in *Cupularia*, also an avicularium in this position is common in *Micropora*.

Setosella vulnerata has a distinct operculum, which closes the ovicell, and I have an ovicell on a specimen from Capri. Jullien[†] describes and figures the ovicells, and Calvet mentions them, but Levinsen[‡] says the ooecia have hitherto been overlooked, and makes a new family Setosellidæ, saying that the ooecia are endotoichal—namely, interior and situated in the distal part,—which is not very clear. The family-name Setosellidæ does not seem to be required.

In studying the ancestrular region of *Micropora coriacea* I found a zooecium, apparently an ancestrula, with a large central opening (Pl. XXI. fig. 3), but the specimen was broken, so that it is impossible to say whether it is the ancestrula or a next neighbour.

Loc. Shetland; Capri (*W.*); Algiers; Tunis; Spain, with ovicells (*Calvet*); Bay of Biscay; Morocco; between

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[*] Waters, "Selenariadæ and Conescharellinidæ," Journ. Linn. Soc., Zool. vol. xxxiv. p. 410, &c., pl. xxx. figs. 9, 11 (1921).

[†] 'Drag. du Travailleur,' Jullien, Bull. Soc. Zool. de France, vol. vii. p. 28, pl. xvii. fig 66 (1882).

[‡] Morph. Cheil. p. 198. The ovicell of *Diplodidymia complicata*, Rss., seems to correspond with Levinsen's description, see Waters, Proc. Zool. Soc. 1913, p. 491, fig. A.

Fayal and Pico (*W.*); Portugal; Nice; Cape Verde Islands, 460 met. (*Calvet*); Canaries, 3700 met.; Spain, 392 met., 1904, 1068 met.; lat. 25·21 N., long. 63·21 W. (*Levinsen*).

Setosellina roulei, Calvet. (Pl. XXI. fig. 4.)

Setosellina roulei, Calvet, "Exped Sc. du 'Travailleur' et du 'Talisman,'" vol. viii. p. 395, pl xxvi. figs. 5, 6 (1907); Canu & Bassler, N Amer Early Tert. Bry. p. 111, who say it was found fossil in the Priabonian.

The ancestrula corresponds with the other zoœcia, having a similar plain frontal membrane like so many Membraniporæ, also it has a vibraculum near the distal end, as in *Setosella vulnerata*, which has *Micropora* characters.

Loc. S.W. of the Cape Verde Islands, 1900 met.; Cape Blanco, 2330 met. (*Calvet*); Capri, 50 fath. (*Waters*).

Micropora uncinata, Busk. (Pl. XXI. fig. 5.)

Micropora uncinata, Busk, Zool. Chall. Exp. vol. x. p. 71, pl. xv. fig. 7 (1884).

Andreela uncifera, Jullien, "Cap Horn," p. 80, pl. iv. fig. 9; xiv figs. 1-3 (1888).

This shows the ancestrula, but the preservation is not sufficiently good to be certain of the number of spines, but I believe there are 13. The avicularium is frequently just as figured by Busk, but it may be more pillar-shaped, with the mandible at the side. A few zoœcia near it have 6 spines, the later zoœcia have 2 spines, sometimes 4.

Cribrilina patagonica, Waters. (Pl. XXI. fig. 11.)

Cribrilina patagonica, Waters, "Bry. from near Cape Horn," Journ Linn. Soc, Zool. vol. xxix. p. 236, pl. xxviii. figs. 6, 7 (1904).

The ancestrula shows a central pit as often found in incrusting Cheilostomata, and in *patagonica* it is without any signs of spines. The zoœcia appear to radiate regularly from it and in ordinary zoœcia there is a distal avicularium which is represented by the pore at the end of the ovicell, for above the ovicell there is no avicularium, whereas, in *Cribrilina* (*Membraniporella*) *magellanica* [*], Calvet, which is so closely allied, there is no avicularium, but a pore which may represent an avicularium. Calvet's and my species were described in the same year, but I think Calvet was the first, and as in most respects they are so similar probably mine should be considered as a variety.

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[*] Calvet, "Bryozoen," Hamburger Magell. Sammelreise, p. 16, pl. i. fig. 4 (1904).

Lagenipora caminata, Waters. (Pl. XXI. fig. 12.)

Cellepora retusa, var. *caminata*, Waters, "Bry. of the Bay of Naples," Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 194, pl. xiii. fig. 1 (1879).

The ancestrula was found alone without anything to indicate its specific position, and certainly it seemed probable that it belonged elsewhere, until some poor and small colonies of *L. caminata* were found with ancestrulæ or parts of ancestrulæ in various conditions. The little ridges near the distal part of the disk are very interesting and characteristic, indicating the tubes situated longitudinally in the wall of the zoœcium.

No doubt, a mistake was made in calling this a variety of *retusa*, Manzoni, a fossil not very satisfactorily described by Manzoni, and specimens found since my Naples work show that *retusa* from Naples has a quite different ovicell, and should have been described as *Schizoporella*.

Nor am I now satisfied with my work in another respect, for we have this large *L. caminata* common in the Mediterranean, and there is a small *Lagenipora* named *L. granum* with many of the characters very similar although widely differing in size. It then seemed that Savigny figured this small species and named it *boryi*, but this now seems doubtful, and probably it was the larger one which Savigny figured. With a certain amount of uncertainty concerning the Savigny specimen it would seem best to retain the name *caminata*. It has been described under other names, and has been found fossil.

EXPLANATION OF THE PLATES.

Plate XXI.

Fig. 1. *Membranipora membranacea*, L., × 25. Showing double ancestrula. From Plymouth.

Fig. 2. *Setosella vulnerata*, Busk, × 25. Colony with ancestrula resembling the zoœcia of *Membranipora trifolium*. From Algeria, sent by Jullien. A few other similar ancestrulæ seen, though not as perfect as this one. In this specimen the vibracular setæ are lost, but one is added from a Capri specimen, (*a*) opesiule pore, × 85.

Fig. 3. *Micropora coriacea*, Esper, × 50. Zoœcium from the ancestrular region. There is not much doubt as to its being the ancestrula, although the relationship to the neighbouring zoœcia cannot be fully made out. From Hastings.

Fig. 4. *Setosellina roulei*, Calvet, × 25. Showing *Membranipora* characters and vibraculæ as in *Setosella*. From Capri (1)*.

Fig. 5. *Micropora uncinata*, Busk, × 25. Ancestrula from the centre of large colony (1). From 'Challenger,' 135*a* (Tristan da Cunha) growing on a piece of *Adeonella atlantica*.

Fig. 6. *Rosseliana* (*Membranipora*) *patellaria*, Moll., × 50. Dorsal surface showing calcareous tubular radicles. Prepared in Eau de Javelle. From Capri.

Fig. 7. *Rosseliana patellaria*, Moll., × 25. Anterior surface showing zoœcium with trifoliate opesium, and one with straight sides and an ovicell. There are some blind (borgne) cells with an opening in the centre. From Capri.

Fig. 8. Ditto, var. *multijuncta*, Waters, × 25. Centre of a colony showing ancestrula surrounded by zoœcia. From Madeira.

Fig. 9. *Caperia judex*. Kirkpatrick, × 25. From Mauritius (1). Brit. Mus. See "Ancest. of *M. pilosa*," p. 608.

Fig. 10. *Microporella diadema*, MacG., × 25. Showing the centre of a colony with ancestrula. From Tasmania. Referred to p. 600, "Ancest. of *M. pilosa*."

Fig. 11. *Cribrilina patagonica*, Waters. Showing a deep pit on which no spines can be distinguished, × 25. From Cape Horn Expedition (1).

Fig. 12. *Lagenipora caminata*, Waters, × 25. Ancestrula. From Naples.

Plate XXII.

Fig. 1. *Monoporella tahitiensis*, sp. n., × 25. Showing cervicorne spines surrounding the zoœcium. (*a*) Zoœcium with ovicell. (*b*) Zoœcium from which the membrane and spines have been washed away. From Tahiti.

Fig. 2. Ditto, × 25. Centre of colony showing ancestrula

Fig. 3. *Rhamphostomella scabra*, Fab., × 25. The other zoœcia are developing, but are not in a perfect condition. From Franz Josef Land.

Fig. 4. *Mucronella præstans*, Hincks, × 25. From New Zealand.

Fig. 5. *Cellepora avicularis*, Hincks, × 25. Small colony showing ancestrula. From Santa Margherita, Lig.

Fig. 6. *Chorizopora brongniartii*, Aud., × 25. Decalcified growing end from Villefranche-sur-Mer.

Fig. 7. Ditto, × 25. Ancestrula from larger colony. From Santa Margherita, Lig.

Fig. 8. *Haplopoma impressum*, var. *multiporum*, var. nov., × 25. Ancestrula from the base of a colony, seen from the interior.

Fig. 9. *Chorizopora brongniartii*, Aud., × 25. Showing row of pores.

Fig. 10. *Haplopoma impressum*, Aud., × 25. Ancestrula in larger colony.

Fig. 11. *Chorizopora brongniartii*, Aud., × 25. Showing pore-chambers in form of radicles.

Fig. 12. *Haplopoma impressum*, var. *multiporum*, × 25. From Mentone. Base of colony of 16 zoœcia.

Fig. 13. *Haplopoma bimucronatum*, Moll., × 25. Ancestrula in colony. From Naples.

Fig. 14. *Chorizopora brongniartii*, Aud., × 25. From Wanganui, N.Z.

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* (1) indicates that only one specimen with ancestrula has been seen.

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XXXIX.—*Morphology and Zonal Distribution of some Chalk Terebratulids.* By M. R. SAHNI, B.A. (Cantab.) (Research Student, Imperial College of Science and Technology, London).

[Plates XXIII.-XXVI.]

INTRODUCTION AND TECHNIQUE.

The present work was undertaken with a view of reducing to order the perplexing variety of form exhibited by the Terebratulids found in the Chalk. It was hoped to accomplish this by a study of the muscle-impressions and muscle-scars, supplemented by such external characters as might be found to be significant from a classificatory standpoint. Internal characters of this sort (muscle-impressions, etc.) have already been used for diagnostic purposes by Mr. S. S. Buckman* (12), who found that the hard siliceous or calcareous matrix of certain Jurassic Terebratulids, detached by a process of burning (8, 9, 10) and sudden cooling, revealed almost perfect casts, showing in many cases morphological details with extraordinary accuracy and distinctness. To these seminatural—that is, artificially exposed but naturally made—casts were added the natural casts produced by the normal process of weathering. Such natural casts are rare in the British Chalk, except flint casts, which are found as derived fossils in gravels, and cannot, therefore, be assigned to any particular zone. At the same time preliminary experiments with other Terebratulids from that formation soon made it clear that, except in a very few cases, where the internal matrix was siliceous or unusually hard chalk, the method of burning could not be satisfactorily employed on a large scale. In the great majority of cases it was found that the matrix itself flaked off, thus destroying portions of the muscle-impressions, this tendency to flaking being especially marked near their anterior ends, which added considerably to the difficulty of ascertaining their correct shape. Moreover, the shell frequently remained intact near the umbonal end, thus obscuring the details of the posterior ends of the muscle-impressions. In a few cases very good seminatural casts were obtained from specimens with a mediumly hard internal matrix by pure accident. Experiments were also made to expose the muscle-impressions by gradually dissolving away the shell near the dorsal umbo by the application of dilute hydrochloric acid, or by grinding down the same region on a water of Ayr stone, but the results were far from satisfactory.

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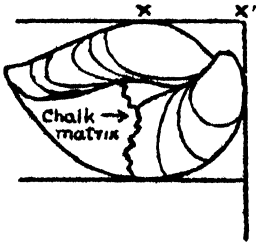
* Full references to literature cited during the course of this paper will be found in the list appended.

These experiments not having proved altogether successful, the writer was forced to have recourse to other means of obtaining casts of the muscle-impressions, etc , and he is greatly indebted to Mr. C. P. Chatwin, of the Geological Survey of Great Britain, for suggesting the use of a dental engine for removing the internal matrix of shells. It was hoped at first only to expose the muscle-impressions by this means, and to secure artificial gutta-percha casts of the interiors of the brachial and pedicle valves. Great care had to be taken in the use of this machine, so as not to obliterate the muscle-impressions by the application of an inappropriately coarse burr or by "overdoing" the specimens. The task was tedious, but, to compensate for this, practice showed that, not only would it be possible to get the muscle-impressions, but that, with reasonable care and caution, even structures of such extreme frailty as the brachial skeletons could also be exposed. As it may be useful for those who wish to work on similar lines, I may be permitted to give some details.

Before work is actually started, it is important that the specimen should be thoroughly cleaned, so as to show up the growth-stages, beak-characters, symphitium, etc., and that it should be photographed in its dorsal, lateral, and anterior aspects. Its dimensions should then be accurately measured, in order to keep a complete and permanent record of the specimen, for it follows, from the nature of the case, that this could not be done satisfactorily once its two valves have been separated. For measuring dimensions the method adopted by Mr. Buckman has been followed, with one addition, namely, that a record is also kept of the length XX′ (see text-fig.), this distance being measured between the dorsal surface of the beak and the highest point on the brachial valve, when the specimen is held horizontally between the two arms of the callipers. All dimensions are measured in millimetres and reduced to percentages of the base-line, for the sake of uniformity (see Burma Memoir, p. 188).

It is evident that, so far as the internal characters are concerned, the dorsal or brachial valve is by far the more important of the two valves. The endeavour, then, has constantly been to secure the brachial valve as complete as possible, even at the expense of having to partly break or destroy the pedicle-valve. In fact, in every case where it was not possible to separate the two valves complete, a small portion (about one-third or more) of the pedicle-valve was removed with a sharp chisel and hammer, leaving the anterior end of the shell exposed ventrally (see text-fig). The specimen was then worked with a burr of suitable size *along and below* the line of junction of the two valves (indicated by the arrow) which were then pulled apart with the fingers. If the chalk is soft, the ventral valve can be cleaned out directly by means of a hard tooth-polishing brush. If, however, the internal chalk matrix is hard, most of it should be first removed with a burr, leaving a thin residual layer of chalk, which can then be worked away with a hard brush as before. Great care, however, has to be exercised in working out the dorsal valve, which carries the brachial skeleton. Practice has shown that the best way is to remove the



Showing specimen ventrally exposed, and length XX'.

chalk enveloping the brachial skeleton first, leaving a sufficiently wide safety margin of chalk around it. (Hardness of the chalk matrix and size of the specimen alone must decide what sort of burr is suitable in any particular case.) In removing the last trace of chalk covering the brachial skeleton, it is advisable to use an extremely fine burr, and to expose a small portion of the external surface of the crura (in no case the loop, as this is extremely delicate and liable to break). The rest of the brachial skeleton should then be worked out along this line of exposure. In many cases it was found advisable to cover the exposed crura with a thin layer of collodion acetone, and to dissolve away the chalk matrix with dilute hydrochloric acid, repeating the process till the whole of the brachial skeleton has been exposed. This method, though somewhat tedious and requiring extreme caution, gives excellent results, and should be used in the case of rare specimens, because it does not involve the same risk of damaging the brachial skeleton as when the latter is worked out with a burr or a brush.

Unless the chalk matrix is extremely soft and easily removable, the safest procedure is to expose the brachial skeleton at the sides only, leaving a supporting column of chalk underneath. The specimen should then be photographed, and the column of chalk worked away after a good print has been obtained. It is essential to photograph or make a drawing of the specimen *before* the entire brachial skeleton has been exposed, as the latter is not infrequently damaged while the last trace of chalk is being removed from underneath. For removing this column of chalk a fine burr is the best, especially when one approaches the brachial skeleton or the region of the muscle-impressions, septum, etc., for in the latter case the outline of the impressions or of the individual scars may be easily obliterated if sufficient care has not been taken in choosing the right size of burr. If the chalk is soft, a small soft tooth-polishing brush gives excellent results for exposing the muscle-impressions, and these sometimes take on a polish which demarks them from the rest of the shell It is needless to add that the movement of a brush is much more difficult to control than that of a burr, so that far more care is necessary in working with the former than with the latter.

In order that the results should be complete, a cast is made of the interior of both brachial and pedicle valves. For this purpose one can use ordinary gutta-percha $\frac{1}{8}$ in. thick sheet, which gives excellent results A small piece of this material is dropped into hot water and when sufficiently soft pressed as quickly as possible into the moistened interior of the pedicle-valve with wet fingers. While the gutta-percha is still soft, a second instalment of the same material is pressed into the shell, to lend as it were an impetus to the former, and so to make the cast somewhat better defined. When dry, the cast can be easily removed and the process repeated if necessary. As usual, a little more care is required in making a cast of the brachial valve, because the softened gutta-percha has to be pushed underneath the delicate loop and then pressed into the valve. For this purpose a narrow, flat, curved metal bar can be used, and a shoemaker's awl is recommended. When the valve is complete, beautiful casts are obtained showing muscle-impressions, septum, and impressions of the pallial sinuses, etc., etc.

MATERIAL FOR THE WORK.

The work was started on some zonally collected specimens kindly lent to me by Mr. A. G. Davis, and in a very great measure I have been indebted to the generosity of the Geological Survey Museum in particular, and to the Castle Museum, Norwich, both of which placed their Chalk Terebratulids at my disposal. In a small measure, I was able to supplement this material by some which I collected in the neighbourhood of London.

Unless otherwise indicated, only those specimens of which the zonal horizon is known with absolute certainty have been utilised for the purposes of this work. The exact position of each specimen within the zone cannot, unfortunately, be ascertained. One, therefore, does not know, for example, whether a particular specimen comes near the top or bottom of the *Mucronata* zone, and this is all the more unfortunate as in this case the zone embraces such a wide span in geological time. The present paper deals with the Upper Chalk only, including the zones of *Ostrea lunata*, *Belemnitella mucronata*, *Micraster coranguinum*, and *Micraster cortestudinarium*. No specimens from either the *Marsupites testudinarius* or the *Actinocamax quadratus* zones were available.

It is perhaps essential to explain why the Upper Chalk should be taken as the starting-point. All the preliminary experiments in the working out of the internal characters of the Terebratulids were made on specimens from the zone of *Holaster planus*, as these showed externally the greatest variation. Owing to the great hardness of the chalk matrix, however, it was found extremely difficult to work *all* the internal details, brachial skeletons, cardinal process, muscle-impressions, pallial sinuses, etc., of each specimen. It was, therefore, impossible to decide what characters, or combination of characters, could possibly be used as a basis of classification. The chalk from the other zones above noted yielded specimens which could be comparatively easily and speedily worked out in all their internal details. It was therefore hoped that, having once established a basis for a natural classification from these specimens, it would be easier to apply it to the lower zones of harder chalk, yielding specimens which could not be completely worked out.

HISTORICAL SUMMARY.

"King (19), 1850, really laid the foundation of the classification adopted at the present time. He first recognized the great importance of internal structures, brachial skeleton, etc., without, however, ignoring the other characters, dental plates (*Epithyris*) or the form of the shell (*Eudesia*, *Pygope*) for example."

"A comprehensive analysis of *Terebratula* was made by Rothpletz (21), 1886. He divided the genus into 8 groups—Biplicatæ, Uniplicatæ, and so forth, and these he parted into some 8 Sippe, or clans. However, his arrangement is also not natural, and it takes little account of morphogenetic development."

In 1917, Mr. S. S. Buckmann (12; see also 5, 6) published his remarkable memoir on "The Brachiopoda of Namyau Beds, Northern Shan States, Burma," giving therein, for the first time, a comprehensive morphogenetic study of several Rhynchonellids and Terebratulids. It is only with the latter that we are here concerned. He has shown in a very lucid manner that it is only by a careful study of the morphogeny of an individual specimen that its true generic position can be ascertained, or the full significance of its relationship with other forms adequately appreciated. Far more importance was attached to the method by which a certain type of plication, biplication, or multiplication, for example, was attained, rather than to the actual type of the plication itself; for it has been demonstrated that similarly plicate shells have, in several cases, reached their adult forms along different developmental stages, and so must be separated. Thus, for example, "if the anterior margin of *Eudesia* be compared with that of *Terebratula fimbria* both appear to be the same—multiplicate rectimarginate. Then the fully plicate *Eudesia* might be supposed to represent simply a further development of the semiplicate *T. fimbria.* But their developmental history is quite distinct. *T. fimbria* shows the direct multiplication of the rectimargin; *Eudesia* has passed through the everted (lophothyrid) stage, and has attained to multiplication by a long process of repeated splitting (sulcation) of plicæ, which has reduced the eversion till a rectimargin has been again acquired."

Similar remarks are applicable to other features, ornamentation, etc., of Brachiopoda. They should be borne in mind also in dealing with brachial skeletons—similar skeletons, like similar foldings, may have different histories; they are generally, but not always, proof of identity. A very important consideration, however, on which Mr. Buckman has separated his Terebratulid genera is the form of the impressions left by the posterior and anterior adductors on the dorsal valve. These were obtained on the casts by burning the specimens, though it is observed that "the burning process is not so satisfactory with Terebratulidæ as with Rhynchonellidæ. And the dorsal muscle-scars do not appear to give the same range of variation as is found among the Rhynchonellidæ, while little can be made of the ventral muscles."

I have already remarked that an attempt was made with the Chalk Terebratulids to obtain natural casts by a process of burning, but without success. It was, however, possible to clear up the interior of both the brachial and pedicle valves by means of an ordinary dental engine, and to make artificial gutta-percha casts thereof, for purposes of comparison. While full details of these muscle-impressions may be left for later consideration, suffice it is to say here that, so far as the majority of the Chalk Terebratulids worked out are concerned, the muscle-impressions of either the dorsal or ventral valve cannot be utilised for a satisfactory natural classification of this group.

By far the large majority of Chalk Terebratulids have been supposedly attributed to the genus *Liothyrina.* This identification, it should be noted at the very outset, is entirely erroneous, and, as will be shown later on, no single .chalk specimen has so far been worked out which can be definitely referred to that genus[*]. The error must unquestionably be attributed chiefly to our ignorance of the internal structure, particularly the brachial skeleton of these Terebratulids, and to the fact that they sometimes bear a striking resemblance in their external features to *Liothyrina vitrea*, Born. Incidentally, this demonstrates how dangerous and unfortunate it can be to rely upon external form alone in establishing a basis for a natural classification. Improved methods of working and the interpretation of facts in the light of modern evolutionary principles have shown, however, a state of things hitherto unsuspected. In fact, it has been found possible and necessary to divide the Chalk Terebratulids into several new genera, based not merely upon external characters, which are particularly elusive for classification purposes, but upon different internal characters or combinations thereof. For this purpose the differences in the form of the brachial skeleton and cardinal process have been found to be invaluable. Impressions of the pallial sinuses, the dorsal or ventral muscle-system, do not appear to have the same importance in the case of the Chalk Terebratulids as has been recognized by Mr. Buckman (1917) for his Jurassic specimens. In spite of the fact that almost perfect artificial casts of the muscle-impressions, etc., were obtained, showing, in most cases, details with great clearness, I was unable to establish any definite correlation between the form of the loop and that of the muscle-impressions or pallial sinuses. The conclusions then seem to be irresistible that, were it possible to work out their brachial skeletons, the position of some at least of the Jurassic Terebratulids, which have been separated on the basis of their muscle-impression, may have to be interchanged; for there is no reason to suppose that a basis of classification which has been found to be a true and natural one for the Chalk Terebratulids should break down when applied to other Terebratulids, whatever their geological age. Mr. Buckman was kind enough to examine some of my artificial casts, without, however, studying the corresponding loop-types, and he also recognized the necessity of revising his genera on the basis of their brachial skeletons; but, whereas it seems likely that interchange of position of some of his genera is possible, he regards their further subdivision as the only alternative. In other words, he thinks that some at least of the muscle-impressions which appear to be similar in shape may be really different or *vice versâ*, the true form having become hidden by deposition of callus or by some other factor. It is not without considerable hesitation that this point is pressed, for it seems conceivable that natural casts obtained by the burning process may give a truer impression of the interior of the valves than artificial gutta-percha casts, though the statement made with regard to the Chalk Terebratulids may be verified from the actual specimens themselves. In those cases in which a semi-natural cast was secured by accident or otherwise, the latter was in no wise different from the artificial casts afterwards obtained.

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[*] It is interesting to note, however, that the brachial skeleton of one form which I have called *Neoliothyrina* (*N. obesa*=*Terebratula obesa*, Davidson, *non* Sowerby), actually passes through the *Liothyrina* stage, though its adult loop is quite different. I have also given an account of three apparently hitherto undescribed forms from the Upper Jurassic (Weisse Jura, *β–ε*, of Germany) which possess a *Liothyrina*-like loop (see pp. 376-377). That no species of *Liothyrina* has so far been found in the British chalk is somewhat surprising.

THE GENUS *LIOTHYRINA*.

The genus was first definitely established by Douvillé (16) in 1879, under the name of *Liothyris*, and he recognized *L. vitrea* as the genoholotype. As, however, this name had been already used for one of the Pelecypoda, Oehlert in 1887 changed it to *Liothyrina*.

In view of the fact that so many of the Chalk Terebratulids have been (erroneously) referred to this genus, it will not be out of place to reproduce Douvillé's original description of the genotype in full. This will also enable the reader to compare it with other genera presently to be described. A figure showing the Brachial Skeleton of *L. vitrea*, Born., is also given (Pl. XXIII. fig. 11). The diagram of the dorsal valve in Zittel's (25) 'Text-book of Palæontology' seems somewhat imaginary, for the type of brachial skeleton shown does not belong to *Liothyrina*, though, curiously enough, the valve itself does.

One other point should be mentioned. In the dorsal view of Douvillé's specimen (*L. vitrea*) the condition of the foramen appears to be attrite, while certain other recent specimens which the writer has examined appear to possess a slightly labiate foramen, which is clearly a different (later) developmental phase than the former, and must, therefore, be specifically distinct. Hence it is desirable that the term *Liothyrina vitrea* should be restricted to specimens with an attrite foramen, and other specific names given to specimens with different types of foramen, etc. A description of the genus may now be given:—

"Coquilles toujours lisses, ovales, allongées ou globuleuses, appartenant au groupe des *Cinctæ*. Grande valve à crochet non carénée sur les côtés, tronquée à son extrémité par un foramen très petit. Appareil constitué comme dans le genre *Terebratula*, ne dépassant jamais le tiers de la longueur de la petite valve, et formé de deux lamelles currentes reliées directement à une barre transversale (pont) légèrement arquée. Septum medium nul. Plateau cardinal peu développé; apophyse calcanéenne très développée et souvent même creusée pour l'insertion du muscle cardinal ou rétracteur. A l'intérieur de la petite valve quatre sillons longitudinaux plus ou moins prononcés où s'attachent les sinus veineux palléaux. *Appareil palléal* formé de spicules étoilés très grêles et espacés.

"Nous n'avons guère à ajouter à ces caractères que l'absence de cloisons rostrales."

Before we proceed to the actual description of the Chalk Terebratulid genera, it appears necessary to explain some additions to Brachiopod terminology which have been used in these descriptions. Considering for the present the brachial valve only:—

(1) A distinction has been drawn between a ***Pseudoseptum***, which, as a rule, presents itself as a rather broad and more or less flat ridge between the dorsal muscle-impressions, and the true septum which appears as a narrow linear projection superposed upon the Pseudoseptum. This distinction appears necessary for the two structures may even be regarded as being developmentally distinct, for, whereas the former seems to be formed, at least partly,

by excavation of the shell by the muscle-impressions, the latter must be accounted for by the actual deposition of shell-material upon the Pseudoseptum. This view is also supported by the fact that where the muscle-impressions are feeble, the Pseudoseptum is hardly developed or not developed at all (e.g., *Piarothyris rotunda*).

(2) In describing crura, which are more or less triangular, the margin nearest the cardinal process is called the *posterior dorsal*, that away from it the *anterior dorsal*, while the ventral one is known as the *ventral margin*. The point of junction of the posterior and anterior dorsal margins, sometimes short and somewhat obtuse, sometimes sharp and more or less prolonged, is called the *crural process*, a term already in use. When the crura are more or less quadrangular, the side on which they are attached to the *crural base* is the *basal margin*. These distinctions, it may be noted, are somewhat arbitrary, but, nevertheless, they appear to be necessary for accuracy and convenience of description. The crural bases vary considerably in their degree of development—for example, they are practically evanescent in *Gibbithyris gibba* (Pl. XXIII. fig. 4), while they show an enormous development in *Chatwinothyris subcardinalis* (see Pl. XXIII. fig. 9), in which species they considerably overlap the cardinal process on either side, and obscure its true characters. Intermediate degrees of development of this structure are met with in other genera from the different chalk-zones.

SYSTEMATIC.

In the case of each of the following new genera the generic diagnosis, drawn up from all the known species of the genus, is first given. Some important distinctions from other genera described herein are then noted, followed by a brief account of the different species including the genotype. Whenever a genus is not represented by more than one species only a description of the genotype will be given, the generic diagnosis, however, being noted in the usual order.

1. Superfamily **TEREBRATULACEA**, Waagen.

Family **Terebratulidæ**, Gray (18).

Subfamily *TEREBRATULINÆ*, Dall.

(1) Genus PULCHRITHYRIS *, nov.

Genotype, *P. gracilis*, sp. n. = *Terebratula elongata*, auctt. pars.

Generic Diagnosis.—Mesothyrid; beak small, more or less curved over the dorsal umbo; beak-ridges narrow but fairly distinct; foramen small, circular, attrite; deltidial plates conjunct, forming a symphytium which is not well exposed. Morphogeny: biconvex rectimarginate to incipiently sulcate.

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* *Pulcher*, beautiful.

Brachial skeleton (Pl. XXIII. figs. 6, 6 *a*) of a very distinctive type. Crura narrow, gently inclined inwards, more or less quadrangular, but with a comparatively short basal margin. The basal margin is sometimes very short indeed, thus giving the crura a somewhat triangular appearance. Crural processes small, sharply pointed and curved inwards. Crural bases conspicuous and well separated from the cardinal process. Loop exceptionally flat, bow-shaped with anteriorly directed apex (a very distinctive feature).

Cardinal process more or less globular with a flat dorsal surface, bearing two well-developed knobs posteriorly, and a somewhat less conspicuous median one anteriorly (the relative development of these knobs is somewhat variable in different species).

Distinction.—From *Ellipsothyris*, the well-defined ellipsoidal cardinal process of the latter, and its narrow, well-arched loop with upwardly directed apex.

DESCRIPTION OF SPECIES.

(1) 1. *Pulchrithyris gracilis*, sp. n.

Mesothyrid; beak slightly curved over the dorsal umbo; beak-ridges fairly distinct; foramen small, circular, attrite. Symphytium with transverse rugosities. Shell almost equally biconvex, rectimarginate, ovate.

Brachial valve (Pl. XXIII. fig. 6; Pl. XXIV. fig. 12 *a*).—*Cardinal process* fairly large. *Muscle-impressions* trapezoidal with anterior apex slightly asymmetrical. The scars of the anterior and posterior adductors are not individually distinguishable. Pallial impressions somewhat divergent; arise from the anterior apices of dorsal muscle-marks and transverse about three-fourths of the length of the valve. *Pseudoseptum* thick, very gradually tapering anteriorly. *Septum* linear. *Dental sockets* well defined.

Pedicle-valve (Pl. XXIV. fig. 12).—*Muscle-system* somewhat ovate in outline with posterior apex prolonged. The adductor impressions are clearly seen in the middle occupying longitudinally a boat-shaped area. What appear to be the impressions of the pedicle and cardinal muscles may also be distinguished, but their boundaries are rather vague. *Pallial impressions* arise from near the lateral margins of the muscle-system and run almost parallel to each other. *Teeth* well defined. Interior of the shell thickened in the umbonal region.

Distinction.—This species resembles *Ellipsothyris similis* in external form, including the beak, but is somewhat smaller. Internal details are, of course, entirely different in the two forms.

Proportions.—29 : 106 : 94 : 65 : 58 *.

Range of Species.—Zone of *Belemnitella mucronata*.

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* These proportions are always given in their usual order—namely, base-line, length, breadth, thickness, and the distance XX′.

Holotype.—No. HBW 395. Collection of Geological Survey, London.

Type-locality.—Magdalen Chapel, Norfolk.

(2) 2. *Pulchrithyris extensa*, sp. n. (Pl. XXV. figs. 8, 8 *a*.)

Mesothyrid, beak strongly curved and somewhat closely appressed to the dorsal umbo; beak-ridges narrow, fairly distinct. Foramen minute; symphytium almost completely hidden. Shell large, unequally biconvex (the dorsal valve being more convex than the ventral), rectimarginate, elongate-ovate, with incipient sulcation of the dorsal valve.

Brachial valve (Pl. XXIV. fig. 15).—Crura more nearly triangular, *cardinal process* small; *muscle-impressions* subtriangular; *pallial impressions* divergent, arising from the anterior apices of the muscle-marks. *Pseudoseptum* narrow; *septum* linear; *dental sockets* deep.

Pedicle-valve (Pl. XXVI. fig. 8).—*Muscle-system* ovate with posterior apex somewhat prolonged. *Pallial impressions* arise from near the lateral margins of the muscle-system and run approximately parallel to each other. *Teeth* well defined.

Distinction.—This species differs from *P. gracilis* in its relative proportions, being about one and a half as long as the latter, the greater curvature of its beak, and, above all, by the anterior incipient sulcation of its dorsal valve. The cardinal process is also smaller and pseudoseptum narrower than in *P. gracilis*.

Proportions.—36 : 110 : 75 (approx.) : 61 : 54.

Range of Species.—Zone of *Belemnitella mucronata*.

Holotype.—No. 7 KCN. Collection of Norwich Museum.

Type-locality.—Norwich.

(2) Genus KESTONITHYRIS *, nov.

Genotype, *K. inflata*, sp. n. (Pl. XXV. fig. 10.)

Generic Diagnosis.—Epithyrid; beak strongly incurved and appressed to the dorsal umbo; beak-ridges not distinct. Foramen small, circular, attrite. No symphytium; shell sub-pentagonal, strongly and about equally biconvex. Morphogeny: biconvex rectimarginate to uniplicate, the uniplica being quite well marked.

Brachial valve (Pl. XXIII. figs. 8, 8 *a*; Pl. XXIV. fig. 9).—*Brachial skeleton* distinctly triangular, crura exceptionally broad (the broadest so far worked out in any Terebratulid genus from the Chalk), gently inclined inwards; posterior dorsal margins nearly straight, and slightly folded over, particularly near the crural bases, in which region they also bear two short triangular processes, one on either side. Loop in the form of a broad arch.

Cardinal process.—Projects from the dorsal umbo as a short, thin, bifid plate.

Muscle-impressions of the dorsal valve are characteristic, being club-shaped, and may possibly be of value for identifying the genus. The anterior and posterior adductor scars are separately visible, their individual boundaries being clearly defined. The anterior adductor-scars are comparatively small and ovate, those of the posterior adductors long and sickle-shaped.

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* From Keston, a village in Kent.

Pallial impressions commence from the anterior ends of the muscle-marks, and are divergent. *Pseudoseptum* broad and flat. *Septum* rudimentary. *Dental sockets* shallow.

Pedicle-valve (Pl XXVI. fig. 15).—*Muscle-system* ovate, well defined as a whole, but the boundaries of the individual muscle-scars are not visible. *Pallial sinuses* leave four deep impressions, diverging from near the posterior end of the muscle-system. The median two are somewhat longer than the two lateral impressions, and run along the outer margin of the muscle-system. *Teeth* comparatively thin and plate-like.

Distinction.—The thin and plate-like cardinal process of *Liothyrina* resembles that of *Kestonithyris* somewhat, but in the latter that structure is bifid; moreover, the brachial skeletons in the two genera are very different, the type of crura in *Kestonithyris* not having been met with in any other genus.

Proportions.—30 : 111 : 110 : 83 : 55.

Range of Species.—Zone of *Micraster coranguinum.*

Holotype.—No. 1 KK. Collection of Mr. A. G. Davis.

Type-locality.—Keston, Kent.

(3) Genus CARNEITHYRIS [*], nov.

Genotype, *C. subpentagonalis*, sp. n. (=*Terebratula carnea*, Davidson, Mon. Brit. Brach. vol. i. pl. viii. figs. 2, 2*a*, *non* Sowerby).

Generic Diagnosis.—Mesothyrid; beak small, somewhat sharp, as a rule moderately, sometimes strongly incurved; beak-ridges narrow, fairly distinct. Foramen small, at times of the pin-hole type, circular, attrite. Symphytium fairly well exposed, except when the beak is strongly incurved. Shell equally biconvex rectimarginate. Five different species of this genus have been described here, and vary in shape from subpentagonal to almost regularly pentagonal, to circular, to elongate, but none of them can be identified as *Terebratula carnea*, Sowerby (22).

Brachial skeleton (Pl. XXIII. figs. 15, 15 *a*) consists of gently inclined crura with basal margins of moderate width. Crural processes sharp, somewhat prolonged; anterior and posterior margins nearly equally curved; ventral margin straight. Crural bases fairly well developed. Loop conspicuously arched in the middle and well inclined inwards.

Cardinal process large, bearing two very well-developed cardinal flaps posteriorly, and a median one anteriorly. The relative degree of development of these flaps varies in different species.

Distinction.—The cardinal process may at first sight appear to resemble that of *Pulchrithyris* or of *Chatwinothyris*, being, as in the other two genera, large and somewhat globular, but its dorsal surface is more or less rounded and not flat (as in *Pulchrithyris*); and it possesses only one instead of three anterior knobs (as in *Chatwinothyris symphytica*). Excepting in this respect, the genus cannot be easily confused with other genera, but distinctions are noted wherever necessary.

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[*] This name has been adopted from the specific name *carnea*.

DESCRIPTION OF SPECIES.

(3) 1. *Carneithyris subpentagonalis*, sp. n.

(Pl. XXV. figs. 3, 3 *a*; Pl. XXVI. fig. 3.)

Mesothyrid; beak fairly well curved over the dorsal umbo, but not in contact with it; beak-ridges narrow, fairly distinct; foramen small, circular, attrite; symphytium well exposed. Shell equally and conspicuously biconvex, rectimarginate, subpentagonal.

Brachial valve (Pl. XXIV. fig. 13).—*Muscle-impressions* subtriangular (compare Pl. XXIV. fig. 2, Paratype), well defined; boundaries of the individual muscle-scars are not clearly visible, but the anterior adductors are probably somewhat broad and pear-shaped, and the posterior adductors comparatively narrow and sickle-shaped. Note the striking resemblance with the corresponding muscle-impressions of *Pulchrithyris extensa* (Pl. XXIV. fig. 15). *Pallial sinuses* leave two well-marked, slightly divergent, linear impressions, arising from the anterior apices of the dorsal muscle-marks. *Pseudoseptum* thick, broad, and gradually tapering towards the anterior extremity; *septum* linear. *Dental sockets* deep.

Pedicle-valve (Pl. XXIV. fig. 13 *a*).—*Muscle-system* well defined, in shape resembles the longitudinal section of a cone superposed upon a hemisphere. Scars of the adductors are distinguishable. *Pallial sinuses* do not appear to leave any distinct impressions. *Teeth* well developed.

Distinction.—From *C. acuminata*, the elongate, somewhat more regularly pentagonal outline of the latter, and its slightly acuter beak and smaller cardinal flaps.

Proportion.—35 : 110 : 91 : 84 : 57.

Range of Species.—Zone of *Belemnitella mucronata*.

Holotype.—8 KCN. Collection of Norwich Museum.

Type-locality.—Norwich.

(3) 2. *Carneithyris circularis*, sp. n.

Mesothyrid; beak slightly curved over the dorsal umbo; beak-ridges not very distinct. Foramen small, circular, attrite. Symphytium well exposed. Shell equally, but only moderately biconvex, circular, rectimarginate.

Brachial valve (Pl. XXIV. fig. 14).—*Muscle-impressions* trapezoidal, well defined. *Pallial impressions* divergent, arising from the anterior apices of the muscle-areas.

Pedicle-valve.—*Muscle-system* well defined, somewhat ovate. *Pallial impressions* arise anteriorly from the muscle-system, and run approximately parallel to each other.

Distinction.—From *C. variabilis*, its less curved beak, well-exposed symphytium, and strongly developed pseudoseptum. Its circular outline is, however, a sufficiently distinctive character to separate this species from all others, belonging to this genus which have been described.

Proportions.—28·5 · 114 : 108 : 67 . 66.

Range of Species.—Zone of *Belemnitella mucronata*.

Holotype.—No. 15 KCN. Collection of Norwich Museum.

Type-locality.—Norwich.

(3) 3. *Carneithyris variabilis*, sp. n. (Pl. XXV. fig. 4.)

Mesothyrid; beak strongly incurved and somewhat closely appressed to the dorsal umbo; beak-ridges narrow. Foramen minute, of the pin-hole type, circular, attrite. No symphytium. Shell of somewhat variable dimensions, strongly and equally biconvex, pentagonal, rectimarginate.

Brachial valve. — *Muscle-impressions* roughly pear-shaped, comparatively broad anteriorly. *Pallial impressions* divergent, arising from the anterior apices of the muscle-marks. *Pseudoseptum* characteristic, being exceptionally narrow towards the anterior end. *Septum* linear. *Dental sockets* deep.

Pedicle-valve.—*Muscle-system* ovate with posterior apex considerably prolonged. Impressions of the adductors well seen in the middle, occupying, as usual, longitudinally a boat-shaped area. *Pallial impressions* arise antero-laterally from the muscle-system, and have a parallel disposition. *Teeth* well defined.

Distinction.—From *C. subpentagonalis*, its well-incurved beak hiding the symphytium, more regularly pentagonal outline, and its narrow characteristic pseudoseptum. From *C. circularis*, the differences are in shape, pseudoseptum, and beak.

Proportions.—30·5 : 105 : 92 : 65 · 46.

Range of Species.—Zone of *Belemnitella mucronata*.

Holotype.—No. 14 CMN. Collection of Norwich Museum.

Type-locality.—Norwich.

(3) 4. *Carneithyris acuminata*, sp. n. (Pl. XXVI. figs. 5, 5 *a*.)

Mesothyrid; beak sharp, well curved over, but keeping quite clear of the dorsal umbo; beak-ridges narrow, fairly distinct. Foramen minute, circular, attrite; symphytium well exposed. Shell equally biconvex, subpentagonal, elongate, rectimarginate.

Brachial valve. — *Muscle-impressions* rather broad, subtriangular. *Pallial sinuses* leave two very closely placed, parallel impressions originating from the muscle-marks. *Pseudoseptum* thick, fairly broad.

Pedicle-valve.—*Muscle-system* ovate-elliptical; area of adductor-scars clearly visible. *Pallial sinuses* as in the other species of this genus. *Teeth* well developed.

Distinction.—From *C. variabilis*, its well-exposed symphytium and curved beak, which is not appressed to the umbo.

Proportions.—31·5 : 106 : 89 : 66 : 54.

Range of Species.—Zone of *Belemnitella mucronata.*

Holotype.—No. 19 CMN. Collection of Norwich Museum.

Type-locality.—Norwich.

(3) 5. *Carneithyris norvicensis*, sp. n. (Pl. XXVI. figs. 1, 1 *a*.)

Mesothyrid; beak moderately incurved; beak-ridges feeble. Foramen small, circular, attrite. Symphytium slightly exposed. Shell moderately biconvex, subpentagonal, rectimarginate.

Brachial valve (Pl. XXIV. fig. 5).—*Muscle-impressions* deep, subtriangular, and comparable with those of *C. subpentagonalis* (Pl. XXIV. fig. 2) and *Pulchrithyris extensa* (Pl. XXIV. fig. 15). *Pallial impressions* distinctive, arising from in between the muscle-marks (instead of from their anterior apices), and forking as it were from the *pseudoseptum*, which is broad and flat. *Dental sockets* deep.

Pedicle-valve (Pl. XXVI. fig. 14).—*Muscle-system* ovate-elliptical. *Pallial impressions* as described for other species. *Teeth* well defined.

Distinction.—From *C. circularis*, the peculiar mode of origin of the pallial impressions; from *C. subpentagonalis*, its general shape and the lesser convexity of its brachial and pedicle valves.

Proportions.—33·5 : 107 : 95 (approx.) : 51 : 50.

Range of Species.—Zone of *Belemnitella mucronata.*

Holotype.—No. 44494. Collection of Geological Survey, London.

Type-locality.—Norwich.

(4) Genus MAGNITHYRIS *, nov.

Genotype, *M. magna*, sp. n. (Pl. XXV. figs. 1, 1 *a*.)

Generic Diagnosis.—Permesothyrid; beak stout, slightly incurved, beak-ridges fairly distinct, subcontinuous. Foramen large, circular, incomplete, attrite, oblique. Symphytium slightly exposed. Morphogeny: biconvex rectimarginate to incipiently uniplicate. Shell large, pentagonal.

Brachial valve (Pl. XXIII. figs. 1, 1 *a*; Pl. XXIV. fig. 1 *a*).—*Brachial skeleton* of uniform width throughout; crura quadrangular, gently inclined, with a comparatively short basal margin. Posterior dorsal margin rather long, very slightly curved, anterior dorsal margin sharply curved. Crural processes restricted; crural bases well developed. Loop in the form of a broad, gently inclined arch.

Cardinal process hemispherical, with a broad, flat, dorsal surface, showing conspicuous growth-lines and bearing three incipient cardinal knobs—two postero-laterally and a median anterior one.

Muscle-impressions pear-shaped, unusually broad, set close together. Boundaries of the individual muscle-scars are not clearly visible, but the anterior adductors are possibly pear-shaped, and the posterior adductor-scars somewhat pod-shaped. *Pallial sinuses* leave four clear impressions, a median pair forking as it were from the anterior end of the *Pseudoseptum* runs nearly to the margin of the valve, and the two lateral impressions, only partially visible, are situated one on either side of this central pair. This is the first instance that four pallial impressions have been met with in the brachial valve, but this character is not distinctive of this genus, and is met with in other genera. *Pseudoseptum* exceptionally narrow. *Septum* linear. *Dental sockets* deep.

Pedicle-valve (Pl. XXIV. fig. 1).—*Muscle-system* ovate-elliptical, fairly well defined. With the exception of the adductor-scars, practically nothing can be made out. *Pallial impressions* arise from along the lateral margin of the muscle-system, and take an almost parallel course. *Teeth* well defined.

Distinction.—From *Carneithyris*, its peculiar obtuse beak, its distinctive cardinal process and brachial skeleton.

Proportions.—34·112 : 106 : 70 : 59.

Range of Species.—Zone of *Belemnitella mucronata*.

Holotype.—No. HBW 304. Collection of Geological Survey, London.

Type-locality.—Thorpe, Norfolk.

(5) Genus Chatwinothyris*, nov. = *Terebratula elongata*, auctt. pars.

Genotype, *C. subcardinalis*, sp. n.

Generic Diagnosis.—Submesothyrid (?), beak sharp, moderately or well curved, but not in contact with the dorsal umbo; beak-ridges feeble. Foramen of pin-hole type, circular, attrite, symphytium sometimes well exposed, sometimes hidden, owing to the curvature of the beak.

Brachial skeleton (Pl. XXIII. fig. 9) consisting of quadrangular crura with rather short posterior dorsal margins. Crural processes small, but curved sharply inwards. Crural bases show a considerable variation in the degree of development in *C. subcardinalis* and *C. symphytica*; but this feature will be referred to later.

Cardinal process large, provided anteriorly with three fairly well-developed, and posteriorly with two moderately developed knobs. Owing, however, to the enormous development of the crural bases in *C. subcardinalis*, the cardinal process in this form is considerably smaller. It is, moreover, partially overlapped by the crural bases which also mask its true character, though there is reason to believe that it is of the same general form as in *C. symphytica*, for the posterior pair of knobs, in all specimens worked out, are quite clearly visible, though the anterior lateral ones are not.

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* I have great pleasure in naming this genus after Mr. C. P. Chatwin, of the Geological Survey of Great Britain, who suggested the subject of this paper, and who also has given me much encouragement in the work.

Distinction.—This genus resembles the forms of *Pulchrithyris* hitherto worked out in general shape, being like them somewhat ovate-elongate, but its sharper beak and broad symphytium are sufficiently distinctive external characters, while the wide differences in the cardinal process and brachial skeleton afford ample evidence for separating the two.

It is a noteworthy fact, however, that while the pedicle muscle-system and pallial sinuses of *C. subcardinalis* are apparently identical with those of *Pulchrithyris*, the dorsal muscle-impressions are not by any means so, and, as will be seen presently, neither the dorsal nor the ventral muscles of *C. subcardinalis* are identical with the corresponding muscle-marks of *C. symphytica*.

DESCRIPTION OF SPECIES.

(5) 1. *Chatwinothyris subcardinalis*, sp. n.

(Pl. XXVI. figs. 4, 4 *a*.)

Submesothyrid; beak well curved over the dorsal umbo; beak-ridges feeble. Foramen minute, circular, attrite. Symphytium broad, but not well exposed. Shell biconvex rectimarginate, ovate, of a dull grey colour.

Brachial valve (Pl. XXIII. fig. 9; Pl. XXIV. fig. 4).—*Muscle-impressions* deep, close to each other, and rather broad anteriorly. *Pallial impressions* divergent, arising from near the inner lateral margins of the muscle-marks. *Pseudoseptum* broad and flat. *Septum* linear. *Dental sockets* fairly deep.

Pedicle-valve (Pl. XXIV. fig. 4 *a*).—*Muscle-system* and *pallial impressions* similar to those of *Pulchrithyris gracilis*, so much so that they need not be described here. *Teeth* sharp and fairly well developed.

Distinction.—From *Pulchrithyris gracilis*, its sharp, well-curved beak and its submesothyrid foramen.

Proportions.—28 : 109 : 91 : 57 : 57.

Range of Species.—Zone of *Ostrea lunata*.

Holotype.—No. 44501. Collection of Geological Survey, London.

Type-locality.—Trimingham, foreshore.

(5) 2. *Chatwinothyris symphytica*.

Submesothyrid; beak very slightly curved; beak-ridge narrow, subdistinct. Foramen minute, circular, attrite. Symphytium broad, well exposed. Shell biconvex rectimarginate; ventral valve carinate near the umbo, pointing to an antecedent sulcate stage. Colour pinkish brown.

Brachial valve (Pl. XXIII. fig. 7; Pl. XXIV. fig. 7 *a*).—*Muscle-*

impressions pod-shaped, narrow, and of approximately uniform width. *Pallial sinuses* leave two well-marked divergent impressions, arising anteriorly from the muscle-areas. *Pseudoseptum* stout. *Dental sockets* well defined.

Pedicle-valve (Pl. XXVI. fig. 9; Pl. XXIV. fig. 7).—*Muscle-system* narrow cuneiform. *Pallial sinuses* as in *C. subcardinalis*. *Teeth* sharp, well developed.

Distinction.—From *C. subcardinalis*, its broad symphytium, the lesser curvature of its beak, feeble development of crural bases, exceptional thickening of the interior of the umbonal region of the pedicle-valve and its carination. The thickening of the ventral valve and its pitted character may, however, be only an old-age feature.

In view of the wide differences in several respects already noted, it is suggested that the two species may be generically different, in spite of the similarity of their brachial skeletons. At the present stage, however, it is not thought desirable to separate them as different genera, and this step can be deferred till the differences, if any, in the developmental history of their brachial skeletons are actually demonstrated.

Proportions.—31 : 120 : 87 : 58 : 55.

Range of Species.—Zone of *Belemnitella mucronata*.

Holotype.—No. 47523 N. Collection of Geological Survey, London.

Type-locality.—Chalk, near Norwich.

(6) Genus PIAROTHYRIS [*], nov.

Genotype, *P. rotunda*, sp. n. (Pl. XXV. figs. 6, 6*a*; Pl. XXVI. fig. 12.)

Generic Diagnosis.—Permesothyrid; beak small, somewhat appressed to the dorsal umbo. Foramen small, circular, attrite, oblique. Symphytium narrow. Both valves equally and very conspicuously convex, imparting a distinct rotundity to the shell. Morphogeny: biconvex rectimarginate to uniplicate, the uniplica rising barely above the general contour of the shell.

Brachial valve (Pl. XXIII. figs. 14, 14*a*; Pl. XXVI. fig. 6).—*Brachial skeleton* unusually narrow, somewhat inclined posteriorly. Crura quadrangular, with fairly wide basal margins; posterior dorsal margin short, gently curved; anterior dorsal margin well curved. Crural processes short; crural bases not well developed. Loop sharply arched in the middle, slightly inclined inwards.

Cardinal process feeble, in the form of a short, thin, semicircular plate projecting from the dorsal umbo.

Muscle-impressions inconspicuous, elongate, pear-shaped, very close to each other. *Pallial impressions* diverging from the anterior ends of the muscle-marks. There are probably two other impressions, one on either side of this median pair, but these are

[*] *Piaros*, fat.

not clearly distinguishable. *Pseudoseptum* absent; *septum* linear. *Dental sockets* very shallow.

Pedicle-valve (Pl. XXIV. fig. 11).—*Muscle-system* somewhat bell-shaped, fairly well defined. Impressions of the adductors and growth-stage are clearly seen, but nothing can be made of the cardinal and pedicle muscles. *Pallial sinuses* leave four well-marked impressions, originating from the dorsal umbo. The median two are slightly curved (bow-shaped with apices pointing sideways), the lateral ones straight and considerably shorter. *Teeth* small. Interior of shell smooth.

Distinction.—From *Kestonithyris*, its less curved beak, its simple semicircular (and not bifid) plate like cardinal process, and, above all, its markedly different brachial skeleton.

Proportions.—25 : 108 : 96 : 78 : 48.

Range of Species.—Zone of *Belemnitella mucronata*.

Holotype.—No. 18 KCN. Collection of Norwich Museum.

Type-locality.—Norwich.

(7) Genus ELLIPSOTHYRIS*, nov. = *Terebratula elongata* auctt. pars.

Genotype, *E. similis*, sp. n. (Pl. XXV. figs. 9, 9*a*)

Generic Diagnosis.—Mesothyrid; beak small, slightly incurved; beak-ridges well defined. Foramen fairly large, circular, attrite; symphytium well exposed. Shell biconvex, rectimarginate, ovate and partly of a fleshy-red colour.

Brachial valve (Pl. XXIII. figs. 13, 13*a*; Pl. XXIV. fig. 8).—*Brachial skeleton* narrow posteriorly, comparatively broad anteriorly. Crura triangular, attached to the crural bases by delicate prolongations; anterior and posterior dorsal margin well curved, as also are the ventral margins, but in a lesser degree. Crural processes of moderate dimensions, sharp. Crural bases moderately developed. Loop narrow, in the form of a gentle arch.

Cardinal process ellipsoidal with flat dorsal surface, bearing two very incipient knobs postero-laterally and a median anterior one. Growth-stages clearly visible.

Muscle-impressions roughly pear-shaped, well defined. *Pallial impressions* arise from the anterior ends of the muscle-marks and run approximately parallel to each other. *Pseudoseptum* not broad, fairly thick. *Septum* linear. *Dental sockets* deep.

Pedicle-valve (Pl. XXIV. fig. 8 *a*).—*Muscle-system* elongate-ovate. *Pallial impressions* arise from along the lateral margin of the muscle-system and run parallel to each other. *Teeth* well formed, not unlike those of *Pulchrithyris*.

Distinction.—From *Chatwinothyris*, its obtuse beak and internal characters. From *Pulchrithyris*, the external differences are less marked, as the beaks and general shape are very similar. The cardinal process and brachial skeletons are, however, very different in the two forms, which, therefore, present a clear case of homœomorphy. But for the sharp internal differences it would indeed be difficult to separate species of *Ellipsothyris*, *Pulchrithyris*, and *Chatwinothyris*, all being more or less ovate-elongate.

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* From the ellipsoidal character of the cardinal process.

Proportions.—32 : 108 : 95 : 64 : 59.

Range of Species.—Zone of *Belemnitella mucronata.*

Holotype. No. 14 KCN. Collection of Norwich Museum.

Type-locality.—Norwich.

(8) Genus GIBBITHYRIS*, nov.

Genotype, *G. gibba*, sp. n. (Pl. XXV. figs. 2, 2*a*, 2*b*.)

Generic Diagnosis.—Epithyrid; beak small, well curved over and closely appressed to the dorsal umbo; beak-ridges strong. Foramen minute, pin-hole type, circular, attrite. No symphitium. Morphogeny: biconvex rectimarginate to uniplicate, the uniplica being well defined.

Brachial skeleton (Pl. XXIII. figs. 4, 4*a*) very distinctive, consisting of broad well-inclined crura, of which the posterior dorsal margin diverge considerably towards the umbo. The crural bases, feebly developed, diverge considerably from the cardinal process and, uniting with the brachial skeleton, enclose between themselves and the posterior dorsal margin a more or less rhomboidal area, which is a distinctive feature. Crural processes restricted. Loop nearly vertical, somewhat sharply arched in the middle.

Cardinal process in the form of a rectangular plate of which the anterior and lateral margins are slightly raised.

Distinction.—From *Kestonithyris*, its peculiar beak, conspicuous beak-ridges and its gibbous subsphæroidal character. In fact, this genus can hardly be confused with any other Terebratulid genus from the Chalk, for these external, combined with the well-marked internal, differences betray it at once. The ventral muscle-marks are distinctive, but the dorsal ones do not appear to be so. One species, *G. concinna*, bears a close resemblance to a Jurassic species *Sphæroidothyris globisphæroidalis* (S. Buckman, Mem. Burma Brach. pl. xx. fig. 1*a*), but is smaller.

DESCRIPTION OF SPECIES.

(8) 1. *Gibbithryis gibba*, sp. n.

Epithyrid; beak well incurved; beak-ridges well defined. Foramen minute, circular, attrite. No symphytium. Shell conspicuously gibbous, somewhat broader than it is long, uniplicate.

Brachial valve (Pl. XXIII. figs. 4, 4*a*; Pl. XXIV. fig. 3).—*Muscle-impressions* feeble, set close together, especially towards the anterior end where they are separated only by the linear septum.

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* *Gibbus*, convex.

Pallial impressions not seen. *Pseudoseptum* flat and broad. *Dental sockets* shallow.

Pedicle-valve (Pl. XXIV. fig. 3*a*).—*Muscle-system* very well defined, more or less bell-shaped, showing at least three growth-stages. Adductor-scars easily distinguishable. *Pallial sinuses* leave four deep impressions diverging from near the dorsal umbo. The median two lie partly along the lateral margins of the muscle-system and are of the same length as the other two, which lie on either side of this central pair. *Teeth* small, rather flat.

Distinction.—From *G. concinna*, its general shape, relative proportions (being broader than long), and its somewhat sharper beak and stronger beak-ridges.

Proportions.—23·5 : 112 · 115 : 93 : 47.

Range of Species.—Zone of *Micraster coranguinum.*

Holotype.—No. ⨀. 1693. Collection of Geological Survey, London.

Type-locality.—Cuckmere Haven, Sussex.

(8) 2. *Gibbithyris seafordensis*, sp. n.
(Pl. XXVI. figs. 2, 2 *a*, 2 *b*.)

Epithyrid; beak somewhat massive, closely appressed to the dorsal umbo; beak-ridges well defined, gently curved. Foramen small, circular (?), attrite (?). Shell strongly biconvex, uniplicate.

I have only one specimen of this species, and unfortunately its internal details cannot be exposed, owing to the hard nature of the matrix.

Distinction.—This species differs from *G. gibba* in its general shape, massive beak, stronger if somewhat more rounded beak-ridges, but especially by the broad depression between the beak-ridges and the brachial valve.

Proportions.—25 (?) : 110 : 98 : 90 : 60.

Range of Species.—Zone of *Micraster coranguinum.*

Holotype.—No. ⨀. 1577. Collection of Geological Survey, London,

Type-locality.—Seaford Cliff, Sussex.

(8) 3. *Gibbithyris concinna*, sp. n.
(Pl. XXV. figs. 7, 7 *a*, 7 *b*.)

Epithyrid; beak large, closely appressed to the dorsal umbo, beak-ridges not very distinct. No symphytium. Foramen minute, circular, attrite. Shell subsphæroidal, strongly uniplicate.

Brachial valve (Pl. XXIV. fig. 10 *a*).—*Muscle-impressions* roughly pear-shaped, separated throughout their length by a narrow *Pseudoseptum. Pallial impressions* four, two forking, as it were, from the pseudoseptum and the other two diverging from near the dorsal umbo.

Pedicle-valve (Pl. XXIV. fig. 10).—For *muscle-system* and *pallial sinuses*, see under *G. gibba*.

Distinction.—From *G. seafordensis*, its smaller size, sphæroidal character, its less conspicuous beak-ridges, and its narrower pseudoseptum.

Proportions.—21 : 114 · 98 : 93 : 52.

Range of Species.—Zone of *Micraster cortestudinarium.*

Holotype.—No. ITP. Collection of Mr. A. G. Davis.

Type-locality.—Tithe pit, Upper Warlingham, Surrey.

(9) Genus ORNITHOTHYRIS[*], nov.

Genotype, *O. carinata*, sp. n. (Pl. XXV. figs. 5, 5 *a*.)

Generic Diagnosis.—Permesothyrid; beak small, ornithiform, curved over but not in contact with the dorsal umbo; beak-ridges indistinct. Foramen of moderate size, circular, attrite. Symphytium. The genotype is of especial interest, owing to the conspicuous carination of its ventral valve, which points to a sulcate ancestry or to a "just antecedent norella (here centronella) stage" (Mr. S. S. Buckman, Burma Brach. p. 16). Morphogeny: biconvex rectimarginate to sulcate to rectimarginate.

Brachial valve (Pl. XXIII. figs. 2, 2 *a*; Pl. XXIV. fig. 6).—*Brachial skeleton* of uniform width. Crura triangular, their basal margins being extremely narrow. Crural bases fairly well developed, somewhat divergent from the cardinal process. Loop shows a sudden arching up in the middle, producing a slight break in the curve and forming as it were a sub-arch.

Cardinal process semi-globular with a flat dorsal surface, bearing two incipient knobs postero-laterally and an equally inconspicuous median one. Growth-stages on the dorsal surface of the cardinal process can be clearly seen.

Muscle-impressions broad, roughly pear-shaped, and separated by a comparatively narrow *pseudoseptum. Pallial sinuses* leave two slightly divergent impressions, originating from the inner lateral margins of the muscle-areas. *Septum* linear. *Dental sockets* deep.

Pedicle-valve (Pl. XXIV. fig. 6 *a*).—*Muscle-system* well defined, ovate-elliptical. *Pallial impressions* closely set, parallel to one another, and arising from the anterior margin of the muscle-system. *Teeth* fairly well developed.

Distinction.—From *Piarothyris*, the only form with which it could be mistaken, by its ornithoid beak, conspicuous carination of its ventral valve, and totally different cardinal process, besides differences in other internal details.

Proportions.—29 : 108 . 84 : 67 : 31.

Range of Species.—Zone of *Belemnitella mucronata.*

Holotype.—No. 17 KCN. Collection of Norwich Museum.

Type-locality.—Norwich.

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[*] *Ornis, Ornithos*, a bird.

APPENDIX.

Since this work was practically finished, some specimens of fossil Brachiopoda, mostly Terebratulids, were given to me by Dr. A. Morley Davies for examination. They are all of them from Germany (Weisse Jura, β–ε, Frankenjura bei Gräfenberg), and are, therefore, of Upper Jurassic age. This fact makes some of the specimens of unique interest, for in their brachial skeleton and cardinal process they bear a striking resemblance, though they are not quite identical with corresponding structures of the recent *Liothyrina*. The time-interval between Upper Jurassic and recent times is, however, so great that it appears extremely unlikely that they are so closely related to *Liothyrina* as the apparent similarity of their internal organisation with that genus suggests; they must, therefore, be regarded as more or less Homœomorphous developments of two different forms. So far as I know, these forms have not been hitherto described, and, in view of the fact that few brachial skeletons of Jurassic Terebratulids are at present known, a brief account of three of these species will be given. But it is not at present proposed to give them new names, as this can be safely deferred till more is known concerning the interiors or other Jurassic Terebratulids.

An account of another new genus from the Chalk quite recently worked out is also here given. It has been called *Neoliothyrina*, in view of the fact that its brachial skeleton passes through the *Liothyrina* stage.

(10) Genus Neoliothyrina, nov.

Genotype, *N. obesa* (*Terebratula obesa*, Davidson (15), Mon. Brach. vol. i. part ii. pp. 53–54, *non* Sowerby).

Generic Diagnosis.—Permesothyrid; beak somewhat massive, slightly curved; beak-ridges strong. Foramen large, circular, reformate. Symphytium narrow. Morphogeny: biconvex rectimarginate to incipiently biplicate. Shell large, conspicuously punctate.

Brachial valve (Pl. XXIII. fig. 8; Pl. XXVI. fig. 10).—*Brachial skeleton* passes through the *Liothyrina* stage, when it has the characteristic triangular appearance, being narrow posteriorly and comparatively wide in the region of the loop. In adult life the brachial skeleton is of practically uniform width throughout. Crura triangular, posterior and anterior dorsal margins well inclined, forming sharp and prolonged crural processes. The posterior prolongations of the crura are somewhat laterally extended, forming narrow platforms. Crural bases lend a characteristic appearance to the brachial skeleton, being unusually broad and curved, enclosing a half cup-shaped depression. Loop of slightly variable width, well arched.

Cardinal process bears some resemblance to that of *Liothyrina*, being short and plate-like, but does not possess the characteristic anterior serrations of the latter, though this is a feature which, if present, might be easily destroyed in fossilisation.

Muscle-impressions broad, somewhat pear-shaped. *Pallial sinuses* leave two linear divergent impressions, arising anteriorly from the muscle-areas. *Pseudoseptum* absent. *Septum* linear. *Dental sockets* shallow.

Pedicle-valve.—*Muscle-system* not well defined, but appears to be somewhat triangular, with posterior apex truncated. No *Pallial impressions* can be distinguished. *Teeth* feeble and plate-like.

Distinction.—In external form this genus cannot be confused with any other so far described. Its brachial skeleton bears a superficial resemblance with that of *Carneithyris*, but there are wide differences in detail, the broad crural bases and lateral extensions of the crura, for example, besides the totally different cardinal processes.

Some other species of this genus have been worked out, but, owing to limitations of space, they are not described here.

Proportions.—Specimen incomplete.

Range of Species.—Zone of *Belemnites mucronata*.

Neotype.—No. HBW 272. Collection of Geological Survey, London

Type-locality.—Thorpe Hamlet, Norfolk.

Description of Upper Jurassic Terebratulids from Germany.

Form No. 1. (Pl. XXVI. fig. 7.)

Permesothyrid (?), beak somewhat large, fairly well curved over the dorsal umbo; beak-ridges rounded, sub-distinct. Foramen large, circular, attrite. Symphytium not well exposed, without transverse rugosities, so far as can be judged from the condition of the shell. Morphogeny: plani-convex rectimarginate to incipiently biplicate. Shell very thin, subcircular.

Brachial valve (Pl. XXIII. fig. 5; Pl. XXIV. fig. 16).—*Brachial skeleton* triangular in appearance, being narrow posteriorly and comparatively wide anteriorly; posterior dorsal margin practically straight, but well inclined; anterior dorsal margin well curved; crural processes of moderate length, curved somewhat inwards and backwards. Crural bases broad, loop varies slightly in breadth and is fairly well arched.

Cardinal process small and plate-like, projecting from the dorsal umbo.

Muscle-impressions broad. The boundary-line between the anterior and posterior adductors is visible only posteriorly. *Pallial sinuses* leave two impressions and arise from the anterior apices of the muscle-marks. This is the first instance, so far as I know, where pallial sinuses have appeared in a Jurassic form. They appear to be similar to those found in the majority of the Chalk forms already described. *Pseudoseptum* broad and flat. *Dental sockets* comparatively narrow, but deep.

Pedicle-valve.—Satisfactory casts cannot be obtained of the interior of the valve, owing to the friable nature of the shell, and, unfortunately, practically nothing can be made out from the actual valve itself.

Distinction.—From No. 3, its planiconvex character and subcircular outline.

Proportions.—Specimen incomplete.

Range of Species.—Upper Jurassic.

Specimen.—No. 1 L. Collection of Imperial College of Science and Technology, London.

Type-locality.—Weisse Jura; β–ε, Frankenjura bei Gräfenberg.

Form No. 2. (Pl. XXVI. figs. 11, 11*a*.)

Permesothyrid (?); beak gently curved, somewhat ornithiform; beak-ridges rounded, indistinct. Foramen large, labiate. Symphytium slightly exposed. Morphogeny: biconvex rectimarginate to incipiently biplicate. Shell elongate, ovate, and bears some resemblance in its general outline to the Vesulian form *Ornithella subtriquetra*, d'Orbigny.

Brachial and Pedicle valves (Pl. XXIII. fig. 10).—The remarks made under the pedicle-valve of the previously described species apply here also.

Distinction.—From No. 2, its biconvex shell, slightly ornithiform; beak, labiate foramen, and its totally different shape.

Proportions.—Specimen incomplete.

Range of Species.—Upper Jurassic.

Specimen.—No. 2 L. Collection of Imperial College of Science and Technology, London.

Type-locality.—Weisse Jura; β ε, Frankenjura bei Gräfenberg.

Form No. 3. (Pl. XXIII. fig. 12.)

Permesothyrid (?), beak gently curved, beak-ridges rounded, indistinct. Foramen large, circular, attrite. Symphytium slightly exposed. Morphogeny: biconvex rectimarginate to incipiently biplicate. Shell ovate.

For rest, see under form No. 2.

Distinction.—From No. 2, the difference in the shape of the shell is well marked and is a sufficiently distinctive feature.

Proportions.—Specimen incomplete.

Range of Species.—Upper Jurassic.

Specimen.—No. 3 L. Collection of Imperial College of Science and Technology, London.

Type-locality.—Weisse Jura, β–ε, Frankenjura bei Gräfenberg.

GENERAL REMARKS AND CONCLUSIONS.

Brachial Skeleton.

It is abundantly clear from the observations made in the foregoing pages that the *brachial skeleton is by far the most important character for generic diagnosis.* It shows a truly remarkable range of variation, yet a constancy of form in any one particular series which is not evinced by any other character, internal or external, of these Chalk Terebratulids, with the sole exception, perhaps, of the cardinal process to be noticed presently. Considering for the moment the crura only, they appear to show a lesser variety of form than the actual loop itself; and, indeed, in some cases, were the loop and cardinal process missing, it would be a matter of some difficulty to assign these specimens to their correct position. In such cases, then, it is the loop which lends a distinctive character to the brachial skeleton as a whole. It is hardly necessary to note that a greater or lesser similarity in the form of the brachial skeleton in different genera only expresses a greater or less degree of consanguinity, the wider the differences the more remote the relationship, and *vice versa.* Thus, whereas the genera *Chatwinothyris* (Pl. XXIII. fig. 7) and *Pulchrithyris* (Pl. XXIII. fig. 6) may be related more or less closely, connection between either of these and *Gibbithyris* (Pl. XXIII. fig. 4) must necessarily be somewhat remote. Here it is necessary to sound a note of warning. Beecher (1, 2, 3) has shown, in his remarkable studies on the ontogeny of several long and short looped forms, that the brachial skeleton during the course of its development undergoes a rapid metamorphosis, and changes in form with somewhat precipitate suddenness. Fischer and Oehlert (17), from observations on the genus *Magellania*, arrived at similar conclusions. For this reason, it is essential that, if the results are to be in any degree reliable, only adult specimens should be chosen for separating different genera, or for purposes of comparison, otherwise different developmental stages of the same genus may be taken for different genera, thus leading to endless confusion. On the other hand, the brachial skeleton of *Chatwinothyris* with its conspicuously arched loop may be taken to represent merely a further developmental stage of the flat-looped *Pulchrithyris*, or *vice versâ*, but, by studying the adults of both these forms, such differences are found to be constant, and the conclusion then seems justified that they must be separated as different genera. It appears to be a noteworthy fact that the angle at which the brachial apparatus is attached to the valve sometimes varies considerably from the usual horizontal orientation, though many more specimens must be worked out before the true significance of this fact is realized. Heretofore, only specimens from the zone of *Holaster planus* have shown this feature, the specimens being, as a rule, strongly biconvex.

Cardinal Process.

This feature has unexpectedly proved *to be a factor of great* importance in the study of Chalk Terebratulids, *and in combination* with the brachial apparatus can be used for generic diagnosis. Like the latter, it also shows a remarkable diversity of form, and, indeed, in all the (ten) new genera described, it is of a distinctive type. There may be a superficial resemblance in some of the forms, but a careful study has, in each case, shown the existence of important differences. Thus the cardinal process of *Kestonithyris*, *Gibbithyris*, and *Piarothyris* are all in the form of thin plates, projecting from the dorsal umbo, but each possesses distinctive differences: the first is bifid, the second has its lateral margins slightly raised up, while the last does not possess this character, nor is it bifid. For further examples, reference can be made to the other genera described. The cardinal process, as a rule, bears small knobs (straight) or flaps (curved), which may be developed in different degrees, and are, no doubt, for the purpose of lending greater power of fixation to the cardinal muscles.

Muscle Impressions.

The muscle-systems of both the brachial and pedicle valves have formed the subject of very careful observations in connection with this work. While the dorsal muscle-impressions, as a whole, are in most cases well defined, little can be made, except in rare cases, of the individual scars. The same applies equally well to the pedicle muscle-system, and besides the adductors, which occupy roughly a boat-shaped area longitudinally in the middle, and which are almost invariably distinguishable, practically nothing can be made out.

It has already been remarked that the dorsal muscle-impressions as seen on natural and semi-natural casts have been used, along with other characters, as a basis for separating Terebratulid genera of Jurassic age. Curiously enough, the ventral muscle-system did not appear satisfactorily on these casts. A careful study of the artificial gutta-percha casts obtained from the Chalk genera seems to indicate that, so far at least as these are concerned, ***neither the dorsal nor ventral muscle-marks can be used as a satisfactory basis for a natural classification.*** Consider, for example, the dorsal muscle-impressions of *Chatwinothyris subcardinalis* (Pl. XXIV. fig. 4) and *C. symphytica* (Pl. XXIV. fig. 7*a*). The differences in shape are so great that, if their brachial skeletons were not known to be identical, the two species might be separated as different genera, though the remarks already made with regard to them should be borne in mind. On the other hand, the pedicle muscle-systems of *Pulchrithyris* and *Chatwinothyris* are almost absolutely identical. No useful purpose can be served by multiplying examples here, as reference can be made to the figures on Pl. XXIV. etc. It follows, then, that ***different muscle-marks are*** *associated with similar loop types and vice versâ*, and the conclusion drawn above, therefore, appears to be justified. The possibility, however, must be pointed out that in some rare and exceptional cases, where the brachial skeletons are similar but muscle-marks different, the latter may have a generic significance, but the developmental history of these loops would be different.

Impressions of the Pallial Sinuses.

Very little regard has been paid by any author to the study of this feature of Terebratulids, and, with the exception of a few isolated cases in which the impressions were sufficiently deep to be visible externally, practically nothing is known. This fact, combined with the tedious process involved in exposing them, owing to the hard internal matrix of shells, is largely responsible for our lack of knowledge, while they do not seem to appear at all, so far as I know, on the casts of any Jurassic Terebratulids obtained by the burning process. This is indeed remarkable, for, in sharp contradistinction to the Jurassic Terebratulids, such impressions do appear very conspicuously either on the dorsal or ventral valve, or both, of the large majority of Chalk Terebratulids hitherto worked out. Unfortunately, however, as may be seen from a comparative study of the gutta-percha casts *they, like the muscle-impressions, do not appear to be of value for classification purposes*, though Douvillé, in his work previously mentioned, observes that they have a generic significance. This conclusion appears to be based on isolated observations, and in any case does not apply to the Chalk Terebratulids. In the majority of cases, there are two more or less divergent or parallel linear (or curvilinear) impressions; sometimes there are four, and in such cases the median two are generally longer than the lateral two.

Septum and Pseudoseptum.

The septum being a rudimentary—or, to be more accurate, an obsolescent—character in Terebratulids is not helpful for separating different genera. The same remark applies also to the *Pseudoseptum*, though this shows a certain amount of variation.

Punctation.

Not much attention has been paid to this feature of Chalk Terebratulids, and it is difficult to say at present whether the type, arrangement, or variations in the density of punctæ can be useful for separating different genera. The evidence in general on this point appears to be somewhat contradictory. Mr. S. S. Buckman (7) was able to distinguish two series among the Terebratulids collected by the Schwedish Südpolar Expedition: (i.) a minutely and closely punctate series, and (ii.) a series with large and distantly placed punctæ. Dr. W. Carpenter (14) observes that the size and arrangement of perforation, can be used in some cases for separating some forms. Mr. F. G. Percival (20), on the other hand, from observations on the variations of density of these punctations in *Terebratula* came to the conclusion that "the amount of variation in a species is so great as to make the density almost valueless as a specific character." Much more, however, requires to be done before any wide generalisations can be made.

Beak Characters.

Beak-characters have been extensively and very successfully utilised for separating genera of Jurassic and Tertiary Terebratulids by Mr. S. S. Buckman (12) and Dr. J. Allan Thomson (23, 24), respectively. The essential point to note in this connection is that the beak, like all other characters, alters in ontogeny, and passes through a definite series of change during the life of the individual, and that such changes are also passed in phylogeny, in the same relative sequence. In adult life different species arrive at different stages of beak-development, and that is a character which distinguishes them from the rest. Thus "in Rhynchonellids nearly all species are Hypothyrid—anything further is very unusual, while in the case of the Jurassic Terebratulids the Hypothyrid condition is very rare, the majority of them being Epithyrid." Here also, as in other cases, the phenomenon of homœomorphy should be borne in mind. Thus Mr. Buckman* observes that "if you have two homœomorphous Terebratulids, one of which has a beak of A stage and the other a beak of B stage, you come to the conclusion that they are different species and possibly different genera (13)—the type of beak suggests that, though they are similar externally, they are dissimilar internally. One, therefore, may lay it down as an axiom—in homœomorphous species if beaks differ it is the outward and visible sign of some inward differences. If, however, species are not homœomorphous, difference of beaks may indicate difference of species, but not necessarily difference of genera." The Chalk Terebratulids afford confirmatory evidence of the views expressed above. A third case may now be noted—that of complete homœomorphy, in every external feature, including the beak. In such cases, then, only internal details will show whether we are dealing with the same or different genera. The genera *Pulchrithyris* and *Ellipsothyris* may be cited as examples of homœomorphous Chalk Terebratulids. It may be pointed out that the phenomenon of homœomorphy is not uncommon among Chalk Terebratulids, especially the rectimarginate forms, so that an examination, howsoever critical, of external form alone cannot always lead to satisfactory results.

It is interesting to observe that *the beaks of Upper Chalk Terebratulids described in the foregoing pages are predominantly Mesothyrid or Permesothyrid*; and this fact is not without significance, for that type of beak is less advanced than the

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* These remarks are from a letter from Mr. Buckman, who has kindly allowed me to quote these extracts.

Epithyrid condition, which obtains among the large majority of Jurassic species. *The Chalk species may be, therefore, regarded as developments from stocks more primitive than most of the Jurassic species.*

This brings the study of Chalk Terebratulids to a close as far as this paper is concerned. Some other forms have also been worked out, but, owing to limitations of space, they cannot be described here. It is hoped to publish these results in a subsequent paper, together with a comparative account of the brachial skeletons and muscle-impressions of some Jurassic Terebratulids. It should not be without importance or interest to know in what respects the interior organisation, particularly the brachial skeletons, of these differ from later forms.

In the end, I wish to acknowledge my indebtedness for the help I have received in various ways. To Dr. A. Morley Davies are due, first of all, my grateful thanks for his guidance and for the great encouragement I have received at his hands throughout the course of this work; to Mr. S. S. Buckman I am equally obliged for his numerous useful suggestions and criticisms, both with regard to the work and matters of technical detail, and for reading through the MS.; to Mr. C. P. Chatwin (Geol. Surv. of Great Britain) for his kindness in suggesting the subject and for much encouragement; to the Keeper of Geology my thanks are due for giving me facilities for studying the Terebratulids in the Natural History Museum, and also to Miss H. Muir Wood and Mr. T. H. Withers for many helpful suggestions, especially with regard to figures; to the Geological Survey Museum, London, and Norwich Museum for the loan of specimens. To the Geological Survey Museum I am particularly indebted for the use of their zonally collected and registered specimens, of which I was given permission to expose the inner details.

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EXPLANATION OF THE PLATES.

All specimens are figured natural size. The same specimen is always marked by the same number, but its different views are distinguished by letters, *a*, *b*, *c*, etc., after the number.

With one exception, the brachial valves of the Genoholotypes only are figured here, but figures of all the three Upper Jurassic Terebratulids are given. Anterior views of specimens with a rectimargin are omitted, and, as far as possible, only dorsal and lateral views of Holotypes or Neotypes are given.

All figures of muscle-impression (except fig. 9 on Pl. XXIV.) are from photographs of artificial gutta-percha casts.

PLATE XXIII.

Fig. 1. ***Magnithyris***, nov. Brachial valve of ***M. magna*** (Holotype), p. 367. 1 *a*, lateral view of brachial skeleton.

Fig. 2. *Ornithothyris*, nov. Brachial valve of *O. carinata* (Holotype), p. 374. 2 *a*, lateral view of brachial skeleton.

Fig. 3. *Kestonithyris*, nov. Brachial valve of *K. inflata* (Holotype), p. 363. 3 *a*, lateral view of brachial skeleton.

Fig. 4. *Gibbithyris*, nov. Brachial valve of *G. gibba* (Holotype), p. 372. 4 *a*, lateral view of brachial skeleton.

Fig. 5. Form No. 1. Brachial valve of specimen described on p. 376 (Upper Jurassic, Germany).

Fig. 6. *Pulchrithyris*, nov. Brachial valve of *P. gracilis* (Holotype), p. 362. 6 *a*, lateral view of brachial skeleton.

Fig. 7. *Chatwinothyris*, nov. Brachial valve of *C. symphytica* (Holotype), p. 369.

Fig. 8. *Neoliothyrina*, nov. Brachial valve of *N. obesa* (Neotype), p. 375.

Fig. 9. *Chatwinothyris*, nov. Brachial valve of *C. subcardinalis* (Holotype), pp. 368, 369.

Fig. 10. Form No. 2. Brachial valve of a rather young specimen described on p. 377 (Upper Jurassic, Germany).

Fig. 11. *Liothyrina*, Douvillé. Brachial valve of *L. vitrea*, Born., p. 360.

Fig. 12. Form No. 3. Brachial valve of specimen described on p. 377 (Upper Jurassic, Germany).

Fig. 13. *Ellipsothyris*, nov. Brachial valve of *E. similis* (Holotype), p. 371. 13 *a*, lateral view of brachial skeleton.

Fig. 14. *Piarothyris*, nov. Brachial valve of *H. rotunda* (Holotype), p. 370. 14 *a*, lateral view of brachial skeleton.

Fig. 15. *Carneithyris*, nov. Brachial valve of *C. subpentagonalis* (Holotype), p. 364. 15 *a*, lateral view of brachial skeleton.

Plate XXIV.

Fig. 1. *Magnithyris*, nov. Internal cast of pedicle-valve of *M. magna* (Holotype), p. 367. 1 *a*, brachial valve.

Fig. 2. *Carneithyris*, nov. Internal cast of brachial valve of *C. subpentagonalis* (Paratype), p. 365.

Fig. 3. *Gibbithyris*, nov. Internal cast of brachial valve of *G. gibba* (Holotype), p. 372. 3 *a*, pedicle-valve, p. 373.

Fig. 4. *Chatwinothyris*, nov. Internal cast of brachial valve of *C. subcardinalis* (Paratype), p. 369. 4 *a*, internal cast of pedicle-valve (Holotype), p. 369.

Fig. 5. *Carneithyris*, nov. Internal cast of brachial valve of *C. norvicensis* (Holotype), p. 367.

Fig. 6. *Ornithothyris*, nov. Internal cast of brachial valve of *O. carinata* (Holotype), p. 374. 6 *a*. pedicle-valve.

Fig. 7. *Chatwinothyris*, nov. Internal cast of pedicle-valve of *C. symphytica* (Holotype), p. 370. 7 *a*, brachial valve, p. 369.

Fig. 8. *Ellipsothyris*, nov. Internal cast of brachial valve of *E. similis* (Holotype), p. 371. 8 *a*, pedicle-valve.

Fig. 9. *Kestonothyris*, nov. Semi-natural internal cast of brachial valve of a species closely allied to *K. inflata*, p. 368.

Fig. 10. *Gibbithyris*, nov. Internal cast of pedicle-valve of *G. concinna* (Holotype), p. 373. 10 *a*, brachial valve.

Fig. 11. *Piarothyris*, nov. Internal cast of pedicle-valve of *P. rotunda* (Holotype), p. 371.

Fig. 12. *Pulchrithyris*, nov. Internal cast of pedicle-valve of *P. gracilis* (Paratype). 12 *a*, internal cast of brachial valve of Holotype, p. 362.

Fig. 13. *Carneithyris*, nov. Internal cast of brachial valve of *C. subpentagonalis* (Holotype), p. 365. 13 *a*, pedicle-valve.

Fig. 14. *Carneithyris*, nov. Internal cast of brachial valve of *C. circularis* (Holotype), p. 365.

Fig. 15. *Pulchrithyris*, nov. Internal cast of brachial valve of *P. extensa* (Holotype), p. 363.

Fig. 16. Form No. 1. Internal cast of brachial valve of specimen described on p. 376 (Upper Jurassic, Germany).

Plate XXV.

Fig. 1. *Magnithyris*, nov. Dorsal view of *M. magna* (Holotype), p. 367. 1 *a*, lateral view.

Fig. 2. *Gibbithyris*, nov. Dorsal view of *G. gibba* (Holotype), p. 372. 2 *a*, 2 *b*, anterior and lateral views.

Fig. 3. *Carneithyris*, nov. Dorsal view of *C. subpentagonalis* (Holotype), p. 365. 3 *a*, lateral view.

Fig. 4. *Carneithyris*, nov. Dorsal view of *C. variabilis* (Paratype), p. 366.

Fig. 5. *Ornithothyris*, nov. Dorsal view of *O. carinata* (Holotype), p. 374. 5 *a*, lateral view.

Fig. 6. *Piarothyris*, nov. Dorsal view of *P. rotunda* (Holotype), p. 370. 6 *a*, anterior view.
Fig. 7. *Gibbithyris*, nov. Dorsal view of *G. concinna* (Holotype), p. 373. 7 *a*, 7 *b*, anterior and lateral views.
Fig. 8. *Pulchrithyris*, nov. Dorsal view of *P. extensa* (Holotype), p. 363. 8 *a*, lateral view.
Fig. 9. *Ellipsothyris*, nov. Dorsal view of *E. similis* (Holotype), p. 371. 9 *a*, lateral view.
Fig. 10. *Kestonithyris*, nov. Dorsal view of *K. inflata* (Holotype), p. 363.

PLATE XXVI.

Fig. 1. *Carneithyris*, nov. Dorsal view of *C. norvicensis* (Holotype), p. 367. 1 *a*, lateral view.
Fig. 2. *Gibbithyris*, nov. Dorsal view of *G. seafordensis* (Holotype), p. 373. 2 *a*, 2 *b*, anterior and lateral views.
Fig. 3. *Carneithyris*, nov. Dorsal view of *C. subpentagonalis* (Paratype), p. 365.
Fig. 4. *Chatwinothyris*, nov. Dorsal view of *C. subcardinalis* (Holotype), p. 369. 4 *a*, lateral view.
Fig. 5. *Carneithyris*, nov. Dorsal view of *C. acuminata* (Holotype), p. 366. 5 *a*, lateral view.
Fig. 6. *Piarothyris*, nov. Internal cast of brachial valve of *P. rotunda* (Holotype), p. 370.
Fig. 7. Form No. 1. Dorsal view of specimen described on p. 376 (Upper Jurassic, Germany).
Fig. 8. *Pulchrithyris*, nov. Internal cast of pedicle-valve of *P. extensa* (Holotype), p. 363.
Fig. 9. *Chatwinothyris*, nov. Pedicle-valve of *C. symphytica* (Holotype), p. 370, showing pitted character of the interior of the umbonal region.
Fig. 10. *Neoliothyrina*, nov. Internal cast of brachial valve of *N. obesa* (Neotype) p. 375.
Fig. 11. Form No. 2. Dorsal view of specimen described on p. 377. 11 *a*, lateral view.
Fig. 12. *Piarothyris*, nov. Lateral view of *P. rotunda* (Holotype), p. 370.
Fig. 13. *Liothyrina*, Douvillé. Internal cast of dorsal valve of *L. vitrea*, Born p 360.
Fig. 14. *Carneithyris*, nov Internal cast of pedicle-valve of *C. norvicensis* (Paratype), p. 367.
Fig 15. *Kestonithyris*, nov. Internal cast of pedicle-valve of *K. inflata* (Paratype), p. 364.

XL.—*New or little-known* Tipulidæ (*Diptera*).—XXVII. *Palæarctic Species.* By CHARLES P. ALEXANDER, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

The present paper is based on material from various parts of the Palæarctic Region. The interesting *Limnophila* from Novaya Zemlya, as well as a series of *Nephrotoma* from China, were included in collections sent to me for naming by Dr. Séguy of the Paris Museum. The various species from Japan were collected by my friends Messrs. Esaki, Hori, Kuwayama, Takahashi, and Takeuchi. The large and interesting *Brithura* was collected by Dr. Hervé-Bazin in China and presented by him to Dr. Joseph Bequaert, who very kindly gave the material to me. Additional Chinese material was received from my friend Professor Jacot. My sincere thanks are extended to all of the above gentlemen for their kindness in collecting this material. Except where stated to the contrary, the types are preserved in the writer's collection.

Limonia biceps, sp. n. (Figs. 2, 3.)

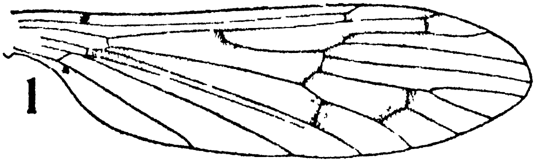
General coloration reddish testaceous, the pronotum and anterior præscutum darkened medially; wings uniformly pale brown, the stigma oval, darker brown; cell *1st* M_2 open by the atrophy of *m*; male hypopygium with the rostriform appendage of the ventral dististyle bearing a powerful spine beyond mid-length; a second spine at the basal mesal angle of this style.

Male.—Length about 9·5 mm.; wing 10 mm.

Rostrum and palpi black. Antennæ with the basal segment of the scape black, the 2nd segment greenish; flagellum greenish yellow, the basal segments oval, soon passing into elongate cylindrical, all with very long and conspicuous verticils. Head dark brown; vertex between the eyes narrower than the diameter of a single eye.

Pronotum dark brown, the sides of the posterior notum paler. Mesonotum shiny reddish testaceous, with greenish body tints, the præscutum with the anterior median portion blackened, the colour fading out behind and becoming obsolete near mid-length of the sclerite. Pleura shiny greenish testaceous, the green tints especially conspicuous near the legs. Halteres pale brown, brighter at extreme base of stem, the knobs darker. Legs with the coxæ and trochanters strongly tinged with green; femora obscure yellow, the tips broadly and conspicuously blackened, the amount subequal on all the legs; tibiæ testaceous-yellow, the tips narrowly blackened; tarsi black, the extreme proximal ends of basitarsi paler. Wings (fig. 2) with a uniform pale brown tinge, the stigma oval, darker brown; costal cell in vicinity of cross-vein *h* darker; veins brown. Venation: *Sc* moderately elongate, Sc_1 ending about opposite mid-length of *Rs*, Sc_2 near the extreme tip of Sc_1; tip of R_1 atrophied beyond *r*; a short supernumerary cross-vein in cell Sc_1, about its own length before *r*; *Rs* long, arcuated at origin, about four times the short arcuated basal deflection of R_{4+5}; cell *1st* M_2 open by the atrophy of *m*; basal deflection of Cu_1 at the fork of *M*.

Abdomen elongate, the tergites dark reddish brown, the incisures still darker; subterminal segments uniformly darkened; sternites more yellowish; hypopygium obscure yellowish. Male hypopygium (fig. 3) with the basistyles (*b*) relatively stout, the mesal lobe large. Ventral dististyle relatively small, the usual rostriform appendage proportionately very large and conspicuous, beyond mid-length extended into a long straight spine from a powerful gently curved base; the apex of the rostrum extends beyond



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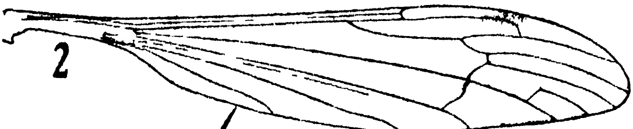

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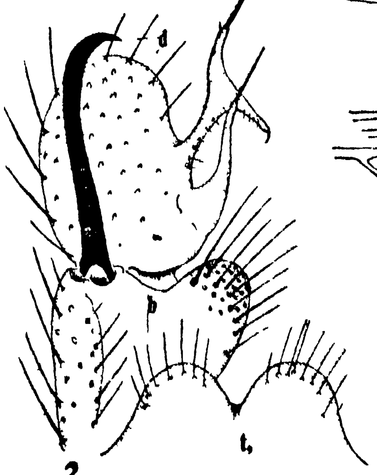

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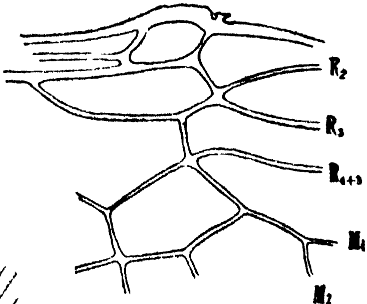

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Fig. 1.—*Limnophila novæ-zemblæ*, sp. n.; wing.
Fig. 2.—*Limonia biceps*, sp. n.; wing.
Fig. 3.—*Limonia biceps*, sp. n.; male hypopygium. *b*=basistyle; *d*=dististyles; t_9=ninth tergite.
Fig. 4.—*Brithura fractistigma*, sp. n.; part of wing, to show venation. *R*=radial veins; *M*=medial veins.

into a slender straight arm, tipped with a powerful curved seta; mesal face of ventral diststyle at base with a second long black spine that terminates a still longer, gently curved, slender basal portion. Dorsal diststyle a powerful nearly straight rod, the apical third gently curved and narrowed, the tip subacute.

Hab. Japan (Kiushiu).

Holotype, ♂, Gokanosho, Higo-no-kuni, altitude 2500 ft., April 29, 1924 (*H. Hori*).

Elliptera jacoti, sp. n.

General coloration black, sparsely pruinose; wings tinged with brown; *Sc* short; R_2 faintly preserved as an apparent cross-vein shortly beyond the fork of *Rs*; R_3 running generally parallel to R_1, cell R_2 at wing-margin very narrow, cell *1st* M_2 open by the atrophy of the outer deflection of M_3.

Male.—Length about 7 mm.; wing about 9·5 mm.

Female.—Length about 6 mm.; wing about 8 mm.

Rostrum and palpi dark brown. Antennæ brownish black throughout. Head black, grey-pruinose, especially anteriorly.

Pronotum and mesonotum shiny black, sparsely pruinose, the sides of the præscutum more heavily so; scutellum a little reddish caudo-laterally. Pleura black, pruinose. Halteres dark brown, the base of the stem narrowly yellowish. Legs with the coxæ yellow, the bases infuscated, more extensively on the fore coxæ; trochanters brownish yellow; remainder of the legs broken. Wings tinged with brown, the stigmal region not darkened; veins darker brown. Venation: *Sc* short, Sc_1 ending before (♀) or just beyond (♂) mid-length of the long *Rs*, Sc_2 a short distance beyond the origin of *Rs*; *Rs* faintly preserved as an *apparent* cross-vein a short distance beyond the fork of *Rs*; R_3 running generally parallel to R_1, cell R_2 at wing-margin being only about one-half the width of cell *2nd* M_2; basal deflection of R_{4+5}, *r–m* and basal deflection of M_{1+2} in approximate alignment; cell *2nd* M_2 about equal to its petiole; cell *1st* M_2 open by the atrophy of the outer deflection of M_3; basal deflection of Cu_1 varying from more than one-half to nearly its own length before the fork of *M*.

Abdominal tergites brownish black, pruinose, the centres of the sternites paler.

Hab. China (Shantung).

Holotype, ♂, Taishan, mid-July 1923, on shaded wet rocks (*A. P. Jacot*).

Allotopotype, ♀.

Elliptera jacoti is named in honour of the collector, Professor Arthur P. Jacot. The species is most closely allied to *E. zipanguensis*, Alexander (Northern Japan).

Limnophila (*Prionolabis*) *acutistylus*, sp. n.

Allied to *L. auribasis*, Alexander; male hypopygium with the inner dististyle terminating in a small acute spine.

Male.—Length 7·5–8 mm.; wing 9·5–11 mm.

Female.—Length about 8 mm.; wing 8 mm.

Rostrum and palpi black. Antennæ black throughout, the flagellar segments short. Head black with a sparse yellowish-grey pollen.

Thorax black, sparsely dusted with yellow pollen. Halteres yellow. Legs with the coxæ and trochanters black; remainder of legs black, the bases of the femora extensively obscure yellow, broadest on the posterior femora where more than the basal two-thirds is included, narrowest on the fore femora where it includes less than the basal third. Wings with a greyish-yellow tinge, the base and costal region brighter yellow; stigma oval, brown; a spot at origin of *Rs*; seams along the cord and outer end of cell 1*st* M_2, and a very conspicuous cloud along vein *Cu* in cell *M*; veins darker brown, those in the yellow areas more flavous. Venation: Sc_2 a short distance from the fork of *Rs*, Sc_1 longer than R_{2+3}; basal deflection of Cu_1 near mid-length of the lower face of cell 1*st* M_2.

Abdomen black, dusted with yellow pollen. Male hypopygium nearly as in *L.* (*P.*) *auribasis*, differing chiefly in the structure of the inner dististyle; outer dististyle relatively slender, terminating in a long, gently curved point, with about two small teeth on mesal edge; inner style terminating in a small acute spine, with one or two smaller spines on outer edge before apex, the lateral angle with a blackened, relatively slender lobe that bears numerous long delicate setæ.

Hab. Japan (Kiushiu).

Holotype, ♂, Mt. Wakasugi, Chikuzen-no-kuni, altitude 2530 ft., April 19, 1924 (*H. Hori*).

Allotopotype, ♀.

Paratopotypes, 3 ♂♂.

"Collected near summit, beneath Japanese Cedar."

Limnophila novæ-zemblæ, sp. n. (Fig. 1.)

Coloration (in alcohol) dark; flagellar segments subglobular; wings subhyaline with a brown pattern, chiefly arranged as seams along the cord and outer end of cell 1st M_2; Sc_2 near tip of Sc_1; r at tip of R_1; R_{2+3} short; cell 1st M_2 very large, its inner end arcuated; basal deflection of Cu_1 about its own length beyond the fork of M.

Female.—Length about 11 mm.; wing 8·7 mm.

Described from an alcoholic specimen.

Rostrum and palpi black. Antennæ dark brown throughout; basal segment elongate-cylindrical; flagellar segments subglobular, the terminal segments smaller, oval. Head black, possibly grey-pruinose in dry specimens.

Thorax black, any possible pruinosity destroyed by immersion in fluid. Halteres relatively short, pale, the knobs slightly infuscated. Legs with the coxæ dark, the trochanters paler brown; femora and tibiæ brown, their tips darker, the surface with short but strong spinous bristles that become longer and more delicate on the outer segments; terminal tarsal segments blackened. Wings (fig. 1) subhyaline with a sparse brown pattern; stigma small; brown spots at origin of Rs and on Sc_1; conspicuous brown seams along the cord and outer end of cell 1st M_2; a conspicuous suffusion in bases of cells M and Cu, more extensive in the former; prearcular region more or less infuscated; veins darkened. Trichiæ of wings, including the anal fringe, reduced to sparse spinous setæ, mostly very small. Venation: Sc_1 extending to beyond the origin of R_2, Sc_2 about one-half the length of Sc_1; Rs long, feebly angulated and weakly spurred near origin; r less than its length from tip of R_1; R_{2+3} a little longer than r; cell 1st M_2 very large, more than twice Cu_1 beyond it, the proximal end arcuated; petiole of cell M_1 and m subequal; basal deflection of Cu_1 about its own length beyond the fork of M; anterior arculus weakly preserved.

Abdomen dark, the pleural membrane paler. Tergal valves of ovipositor very deep, blade-like, rather suddenly narrowed beyond mid-length to the subacute tips; sternal valves short.

Hab. Novaya Zemlya.

Holotype, ♀, Chaîne Fallières, 1908 (Mission Arctique Française; commandée par M. Charles Bénard).

Type in the collection of the Paris Museum.

Certain features of this fly suggest *Dactylolabis*, but the position of the basal deflection of Cu_1 prevents the inclusion of the fly in this genus. Its arrangement in *Limnophila* is in the broad usage of the genus. The fly is widely different from any other known to the writer. The most recent summary of our knowledge of the crane-flies of Novaya Zemlya is in a paper by the writer ("Report of the Scientific Results of the Norwegian Expedition to Novaya Zemlya 1921. No. 5. The Crane-flies," pp. 1–16, figs. 3, 1922).

Pseudolimnophila horii, sp. n.

General coloration dark grey; wings pale brown, the base and costal region more yellowish; stigma oval, slightly darker brown; R_{2+3} relatively short, arcuated.

Male.—Length about 7·5 mm.; wing 9 mm.

Female.—Length about 7·5 mm.; wing 8 mm.

Rostrum and palpi brownish black. Antennæ dark brown, the extreme base of the first flagellar segment a trifle paler; flagellar segment cylindrical to fusiform, with relatively short verticils. Head dark brownish grey, paler on the orbits and anterior vertex.

Thorax dark grey, the præscutum and scutum with a sparse yellowish pollen. Halteres yellow Legs with the coxæ brownish grey basally, the apical portions broadly pale; trochanters obscure yellow; femora light brown, the tips becoming a little darker, the bases a little brighter; tibiæ and tarsi brown. Wings with a pale brown tinge, the base and costal region more yellowish; stigma oval, slightly darker brown than the ground-colour; veins brown, more flavous in the yellow areas. Venation: Sc_1 ending just beyond the fork of *Rs*, Sc_2 at its tip; *Rs* moderately elongate, arcuated; R_{2+3} relatively short, much shorter than in *P. kirishimensis*, about two-thirds the basal section of R_3, gently arcuated and in alignment with R_3; basal deflection of Cu_1 from one-half to nearly its own length from the outer end of cell 1*st* M_2; anterior arculus lacking.

Abdomen dark brown, the sternites only a trifle paler than the tergites, in the female quite concolorous.

Hab. Japan (Kiushiu).

Holotype, ♂, Gokanosho, Higo-no-kuni, altitude 2500 ft., April 29, 1924 (*H. Hori*).

Allotopotype, ♀.

Pseudolimnophila horii is named in honour of Professor Hiroshi Hori, to whom I am indebted for many favours. The species is readily distinguished from *P. kirishimensis*, Alexander (Kiushiu), as well as from the additional Formosan species of the genus, by the dark grey coloration of the head and thorax.

Dictenidia fasciata semifasciata, subsp. n.

Male.—Length about 11 mm.; wing 11 mm.

Generally similar to typical *fasciata*, Coquillett, differing as follows:—

Basal segment of the antennal flagellum conspicuously light yellow, the following two segments a little lighter-coloured at their distal ends. Genæ obscure yellow. Dorso-pleural membrane sulphur-yellow. Knobs of halteres yellow. Legs with the black femoral tips narrower, occupying less than one-third of the segment. Wings with the broad dark medial cross-band of *fasciata* reduced to a brown seam in cells *C*, *Sc*, and *R*, and a faint cloud in cell *M*; cells *Cu*, *1st A*, and *2nd A* of the ground-colour.

Hab. Japan (Hokkaido).

Holotype, ♂, Nakakebo, Hitaka-no-kuni, August 12, 1923 (*S. Kuwayama*); collector's number 41.

Paratype, ♂, Sarabuto, Hitaka-no-kuni, August 8, 1923 (*S. Kuwayama*).

Tanyptera jozana fumibasis, subsp. n.

Male.—Length 13–17 mm.; wing 11–13.5 mm.

Similar to typical *jozana* (Matsumura), differing as follows:—

Entire head and thorax jet-black, this colour including the pronotum and dorso-pleural membrane, which, in the typical form, are yellowish. Pleura not pruinose. Legs with the trochanters black; hind legs shorter with the tips of the femora more narrowly blackened. Wings with about the basal two-thirds heavily infumed, the wing-base, costal and subcostal cells yellowish; stigma dark brown. Abdomen black, the second and third tergites with the lateral margins broadly yellowish; tergites 4 to 8 with the pale margins more restricted; sternites and hypopygium black.

Hab. Japan (Honshiu).

Holotype, ♂, Chichibu, Musashi-no-kuni, May 31, 1919 (*R. Takahashi*).

Paratopotype, ♂, May 29, 1919 (*R. Takahashi*).

Brithura fractistigma, sp. n. (Fig. 4.)

Mesonotal præscutum chestnut-brown with four paler brown stripes; femora with a yellow subterminal ring; stigma of the male dilated, fractured.

Male.—Length 32 mm.; wing 23.5 mm.

Female.—Length 42 mm.; wing 26 mm.

Frontal prolongation of the head brown, almost black laterally; nasus distinct; palpi dark brown, the incisures of the basal segments yellow. Antennæ brownish black, the second scapal segment fulvous; verticils of the flagellar segments of two colours, the shorter ones black, the elongate ones yellow. Head dark brown medially above, including the conspicuous vertical tubercle, the genæ and broad orbital regions paler ochreous-brown.

Pronotum black medially, the scutellum yellow. Mesonotal prescutum rich chestnut-brown, passing into brownish black around the margins, with four very slightly paler brown stripes, in addition to a capillary median line of the same colour; scutal lobes similarly coloured but more greyish medially; median lobe of scutellum dusky brown, the lateral wings velvety brownish black, this colour passing caudad on to the lateral portions of the mediotergite of the postnotum, caudal margin of postnotal mediotergite paler brown. Pleura brown, the dorso-pleural region broadly ochreous-yellow; a broad grey longitudinal stripe extending from the fore coxæ across the sterno-pleurite to the metapleura. Halteres brownish yellow, the base of the knob darker. Legs with the coxæ and trochanters brownish grey, the latter reddish-tinged; femora yellow, the tips narrowly blackened; a conspicuous yellow subterminal ring that is co-extensive with the black tip; immediately preceding this ring a diffuse brown annulus occupying all except the relatively narrow yellow basal portion; tibiæ pale brown, the extreme base obscure yellow; tarsi black. Wings of the male (fig. 4, p. 387) with the costal margin at the stigma distorted into a blunt lobe that is incised to form a distal truncated tubercle; membrane yellow, variegated with dark brown and grey; stigma fulvous, margined with brown; dark brown spots at arculus; origin of *Rs*; along the cord; in the base of cell *2nd* M_2 and along both sides of vein *1st A* near mid-length, but isolated from the vein by a delicate pale margin; paler grey clouds in the wing-apex, including the outer half of each of cells R_2 and R_3, the distal two-thirds of R_5, and all of the remaining posterior cells, these further variegated by yellow marginal dashes; most of the cells are still further variegated by additional blotches of the ground-colour; cell *M* is variegated by a >-shaped grey cloud near mid-length; anal cells on distal halves clouded with brownish grey; cell *1st A* with two yellow marginal spots; veins bright horn-yellow, contrasting with the remainder of the wing. Venation: Sc_1 present, much longer than Sc_2; *r* subperpendicular to the fork of R_{2+3}; cell

1*st* M_2 high pentagonal, the basal section of M_{1+2} being the longest element; *r–m* and *m–cu* punctiform; *m* a little longer than the petiole of cell M_1.

Abdominal segments dark velvety-brown, the extreme caudo-lateral angles of the segments narrowly ochreous; sternites a little variegated with reddish. Male hypopygium very large; caudal margin of tergite rounded and fringed with an abundance of yellow setæ; ninth sternite terminating in a blunt, blackened, median tubercle.

The female is generally similar to the male, differing chiefly in the sexual characters of a simple stigmal region of the wing and the pruinose scutellum and postnotum (probably also a normal male character). Base of tergal valve of ovipositor bright yellow; tergal valves long and slender, reddish horn-coloured.

Hab. China (Kiang-si).

Holotype, ♂, Kou-ling, near Kiu Kiang, altitude 1000 metres, August 6, 1919 (*J. Hervé-Bazin*).

Allotopotype, ♀, July 31, 1919 (*J. Hervé-Bazin*).

The types of this interesting crane-fly are in the writer's collection, through the kind interest of Drs. Hervé-Bazin and Joseph Bequaert.

Tipula ampliata, sp. n.

General coloration light grey, the præscutum with three darker grey stripes; a more or less complete capillary median brown vitta extending from the vertex to base of abdomen; wings whitish subhyaline and dark brown, cross-banded, the brown bands including the apex and two narrow arcuated areas before the cord; R_2 entire; male hypopygium with the 8th and 9th sternites unarmed.

Male.—Length about 17 mm.; wing 20 mm.

Frontal prolongation of head long, equal to the remainder of the head, dark grey above, paler laterally; nasus rudimentary or lacking; palpi moderately elongate, brownish black. Antennæ moderately elongate, if bent backward not attaining the wing-root; basal segment elongate, obscure fulvous; second segment pale brown; first flagellar segment pale at base, the remainder of the organ black; flagellar segments with moderate basal swellings, feeble incisions and verticils of moderate length. Head grey, the anterior vertex paler; a capillary brown median vitta extending from the vertical tubercle to the occiput.

Pronotum grey, the posterior notum pale, blackened medially. Mesonotal præscutum light grey, with three darker grey stripes, the median stripe split by a narrow, median, black vitta that is a little widened near mid-length, ending before the suture; scutum light grey, the lobes vaguely darker medially; scutellum and postnotal mediotergite clear light grey with a delicate, interrupted, median brown vitta. Pleura light grey, the sterno-pleurite, meron and anepisternum conspicuously marked with darker grey to produce an ill-defined longitudinal striping; dorso-pleural membrane buffy. Halteres pale, including the knobs. Legs with the coxæ pale grey; trochanters obscure brownish yellow; femora pale brown, more yellowish at base, passing into dark brown at tips; tibiæ and tarsi black. Wings with a dark brown and white subhyaline pattern; base and cells *C* and *Sc* more yellowish; the broad wing-apex is entirely dark; two narrow, basal, arcuate bands before the cord, one extending from *Rs* to the fork of *Cu*, following Cu_2 to the margin where it connects with the broad dark apex; these two areas enclose a large and conspicuous whitish area centring at cell 1*st* M_2 and including the apices of cells *R* and *M* and the bases of cells R_2, R_3, R_5, M_3, and Cu_1; the second narrow arcuate band crosses the basal cells near mid-length, broadening out at the caudal margin in cells 1*st* and 2*nd A*; the remainder of cells *R*, *M*, *Cu*, and *Anal* are conspicuously whitish subhyaline; veins brownish black, paler at the base and in the costal area. Venation: R_2 complete; *Rs* relatively short, arcuated; petiole of cell M_1 shorter than *m*.

Abdomen brownish yellow, the basal tergite and lateral margins of the other tergites faintly pruinose; terminal segments passing into dark greyish brown, with paler lateral and more narrow caudal margins. Male hypopygium moderately enlarged. Ninth tergite relatively large, the median area slightly convex, the short, blunt lateral lobes each with its caudal mesal angle produced caudad and mesad in a strong, obscure yellow spine. Eighth and ninth sternites unarmed.

Hab. Japan (Kiushiu).

Holotype, ♂, Gokanosho, Higo-no-kuni, altitude 1000–3000 feet, May 3, 1924 (*H. Hori*).

Tipula sachalinensis, sp. n.

General coloration light grey, the mesonotal præscutum with three brown stripes; wings greyish brown, variegated with dark brown and subhyaline, somewhat as in *T. irrorata*, Macquart; abdomen dark-coloured, pollinose, the caudal margins of the segments narrowly reddish; male hypopygium large.

Male.—Length 15 mm.; wing 15 mm.

Frontal prolongation of head black, the nasus very broad; palpi black. Antennæ with the scape black; flagellum broken; first scapal segment elongate, transversely crenulated. Head light grey; a narrow brown longitudinal line on vertex.

Mesonotal præscutum light grey with three dark brown stripes, the median stripe broadly light grey medially, bisected by a capillary dark brown median vitta; scutum grey, each lobe with two dark brown spots, the caudal one larger; scutellum grey with a median dark spot; postnotal mediotergite grey, the sides and a capillary median line dark-coloured. Pleura light grey, the dorso-pleural membrane obscure yellow. Halteres light brown, the knobs darker. Legs with the coxæ grey; trochanters dark reddish brown; femora reddish brown, the tips broadly blackened; tibiæ dark reddish brown, the tips blackened; remainder of tarsi black. Wings greyish brown, variegated with dark brown and subhyaline; a brown cloud at arculus and another at stigma; subhyaline areas as follows:—A large prearcular area including the base of cell *2nd A*; across cells *M* and *Cu*, at the base of cell *M* and beyond mid-length; before the stigma in cell *2nd* R_1; beyond the stigma in the basal half of cell R_2 and in the base of cell R_3; centre of cell *1st* M_2 and base of cell M_3 pale; veins dark brown. Venation: *m–cu* present, but short.

Abdomen dark, the segments dusted with yellowish grey; caudal margins of the segments narrowly reddish, narrowest on the basal segments, broader and more conspicuous on the distal segments. Male hypopygium large. Ninth tergite large, the caudal margin convexly rounded with a very small U-shaped median notch, with a small rounded knob at the base of the notch; a small tooth at the caudal margin of the notch and another slightly larger tooth more laterad, from which latter tooth the margin of the tergite slopes gradually to the base. Basistyle complete, oval; outer dististyle elongate-oval, the apex obtusely rounded; inner dististyle with the caudal lobes projecting, pale, pubescent. Ninth sternite with a V-shaped notch, the cephalic portions membranous, the notch with a pubescent lobe at its base, the margins of the V with mesally-directed yellow setæ. Eighth sternite with widely separated lateral lobes, each provided with mesally-directed yellow setæ that are decussate on the median line.

Hab. Japan (Karafuto).
Holotype, ♂, collected in 1902 (*Paul Labbé*).
Type in the collection of the Paris Museum.

Nephrotoma nigricauda, sp. n.

Related to *N. lineata* (Scopoli); general coloration yellow, the præscutum and scutum with conspicuous black stripes; wings tinged with yellow; stigma pale; abdomen obscure brownish yellow, the tergites trivittate with dark brown, the terminal segments shiny black; male hypopygium with the extensive eighth sternite deeply notched medially.

Male.—Length 12·5 mm.; wing 14 mm.

Frontal prolongation of head obscure yellow, the dorsum, including the nasus, conspicuously black; palpi brown. Antennæ of moderate length, if bent backward extending about to, or a little beyond, the base of the abdomen; basal segment orange, second segment pale brown; flagellum dark brown. Head yellow, the vertical tubercle conspicuous; a small dark spot on orbit at base of vertical tubercle; occipital brand broadly triangular, dark brown.

Pronotum sulphur-yellow, dark brown laterally. Mesonotum light yellow, the præscutum with three shiny black stripes, the anterior ends of the lateral stripes outcurved and here opaque velvety black; scutal lobes very extensively blackened, the areas continuous across the suture with the lateral præscutal stripes; scutellum obscure yellow, the median lobe more brownish posteriorly; postnotum clear sulphur-yellow, darkened posteriorly. Pleura shiny ferruginous, handsomely variegated with sulphur-yellow, this including the ventral portion of the mesepimeron, the dorsal margins of the mesosternum and a conspicuous area on the lateral sclerites of the postnotum. Halteres pale brown, the knobs broken. Legs with the coxæ and trochanters obscure reddish; femora similar, the tips conspicuously blackened; tibiæ pale brown, the tips gradually blackened; tarsi black. Wings with a strong yellow tinge, the base, costal region, and a conspicuous seam along vein *Cu* more intensively yellow; stigma pale yellowish brown; wing-tip indistinctly darkened; a narrow seam along the basal deflection of R_{4+5} and *r–m*; veins dark brown. Venation: cell M_1 broadly sessile.

Abdomen obscure brownish yellow, the tergites narrowly trivittate with dark brown; sternites with an interrupted dark brown median stripe; tergites 7 to 9 and sternites

8 and 9 shiny black; outer dististyle pale. Male hypopygium with the ninth tergite large, the caudal margin with a deep but very narrow median notch; caudal margins of the lateral lobes shiny black. Eighth sternite extensive, the caudal margin with a very deep U-shaped median notch, from the base of which a narrower impressed line extends almost to the base of the sternite; adjacent margins of this incision without conspicuous setæ.

Hab. Japan (Hokkaido).

Holotype, ♂, Sapporo, Ishikari-no-kuni, end of July 1921 (*S. Kuwayama*).

Paratypes, ♂ ♂, Maruyama, near Sapporo, June 10, 1923 (*S. Kuwayama*).

Nephrotoma angustistria, sp. n.

General coloration yellow; antennæ of male moderately elongate; bases of flagellar segments pale; head with a conspicuous linear black line; lateral præscutal stripes straight; postnotum and scutellum black medially; wings yellow, the apex narrowly blackened; abdominal tergites narrowly trivittate with black; sternites with an interrupted black median vitta.

Male.—Length about 11·5 mm.; wing 11·5 mm.

Female.—Length 16–17 mm.; wing 15–15·5 mm.

Frontal prolongation of head yellow, with a dark brown lateral stripe; nasus elongate, tufted with a few black setæ; palpi dark brown, the terminal segment passing into dull orange. Antennæ of male moderately elongate, if bent backward extending to beyond the base of the abdomen; scape and basal segment of flagellum yellowish; flagellar segments brown, the basal enlargement of the segments obscure yellow; flagellar segments elongate, with a conspicuous basal enlargement. Head shiny yellow, with a linear black vitta extending from the vertical tubercle to the small occipital brand; sides of posterior vertex a little infumed.

Pronotum yellow. Mesonotal præscutum yellow with three shiny black stripes, the lateral stripes straight; scutum yellow, each lobe with a conspicuous black mark; scutellum brownish, darker medially; postnotal mediotergite yellow, more infuscated posteriorly, with a median dark brown dash. Pleura yellow, indistinctly variegated with pale brown. Halteres pale brown, the base of the stem and apex of knobs yellow. Legs with the coxæ yellow, the fore coxæ infuscated basally; trochanters yellow; femora yellow, passing into brown, the tips conspicuously blackened ; tibiæ obscure yellow, the tips narrowly dark brown ; tarsi black. Wings strongly tinged with yellow, the base and cells *C* and *Sc* even more suffused ; stigma oval, dark brown ; wing-apex narrowly infuscated ; a conspicuous brown seam on the anterior cord and narrower, less distinct ones, on the posterior cord and outer end of cell *1st* M_2 ; veins beyond the cord narrowly and indistinctly seamed with brown ; veins brown, paler in the flavous areas. Stigma with few macrotrichiæ (about eight). Venation : cell M_1 petiolate, this petiole a little shorter than *m*.

Abdominal tergites yellow, narrowly trivittate with black ; the median stripe narrowly interrupted at the posterior margins of the segments, the lateral stripes continuous ; sternites yellow, each segment with a median basal black dash ; hypopygium black. Male hypopygium with the eighth sternite deeply incised medially, the caudo-lateral angles with a few yellow setæ. Ninth sternite extensive, near its base with a conspicuous median spine directed ventrad.

In the female, the antennæ are shorter ; centre of scutellum darkened.

Hab. Japan (Hokkaido and Honshiu).

Holotype, ♂, Jozankei, Ishikari-no-kuni, Hokkaido, altitude 1000 ft., August 16, 1923 (*T. Esaki*).

Allotype, ♀, Yumoto, Shimotsuke-no-kuni, Honshiu, altitude 4830 ft., July 23, 1923 (*T. Esaki*).

Paratypes, ♀, with the allotype ; ♂, Shimokebo, Hitaka-no-kuni, Hokkaido, August 9–10, 1923 (*S. Kuwayama*) ; ♂ ♀, Sapporo, Ishikari-no-kuni, Hokkaido, May 17–June 20, 1923 (*S. Kuwayama*).

Nephrotoma ozenumensis, sp. n.

Resembling *N. hokkaidensis*, Alexander ; body yellow with conspicuous black and blue-black markings ; lateral præscutal stripes with a velvety-black spot at anterior end of each ; wings greyish yellow, the apex narrowly seamed with brown ; abdominal tergites with a broad black median stripe.

Female.—Length 18 mm. ; wing 15·5 mm.

Frontal prolongation of head yellow, the apex with an oval black dorsal spot that includes the nasus ; palpi light brown, the second segment obscure yellow. Antennæ with the scape rufous ; flagellum entirely black. Head light yellow ; a small brown spot on vertex adjoining the margin of the eye opposite the narrowest part of the vertex ; occipital brand black, continued caudad on to the occiput.

Pronotum light yellow, the sides conspicuously blackened. Mesonotal præscutum yellow with three shiny blue-black stripes that narrowly restrict the interspaces, the lateral stripes with a deep velvety-black spot on lateral face of their cephalic ends ; suture velvety black ; scutal lobes blue-black, the median area yellow ; scutellum blue-black, the parascutella yellow ; postnotal mediotergite yellow with an inverted T-shaped black mark. Pleura yellow, the ventral margins of the anepisternum and sterno-pleurite conspicuously blackened ; other dark markings on the propleura, the ventral portion of the pteropleurite, the meron, and a U-shaped brown ring on the postnotal pleurotergite. Halteres yellow, the knobs obscure. Legs with the coxæ reddish, the bases blackened, most extensively so on the fore coxæ ; trochanters obscure yellow ; femora brownish yellow, the tips extensively blackened, more broadly on the fore femora ; tibiæ yellowish brown, passing into black at tips ; tarsi dark brown. Wings tinged with greyish yellow, the base and cells *C* and *Sc* brighter ; stigma relatively large, oval, dark brown ; wing-apex narrowly infuscated ; a narrow brown seam along the anterior cord ; obliterative areas at proximal end of stigma and across the base of cell *1st* M_2 ; veins dark brown, yellowish in the flavous areas. Numerous macrotrichiæ on the proximo-caudal region of the stigma. Venation : Sc_1 preserved ; cell M_1 very narrowly sessile ; *m–cu* long, at the fork of *M*.

Abdominal tergites yellow with a broad, black, uninterrupted median stripe, on segments 7 and 8 including the entire sclerites ; lateral margins of tergites infuscated ; sternites obscure yellow. Ovipositor reddish horn-colour, the base of the sternal valves blackened.

Hab. Japan (Honshiu).

Holotype, ♀, Lake Ozenuma, on boundary between Iwashiro-no-kuni and Kotsuke-no-kuni, altitude 5460 ft., July 25, 1923 (*T. Esaki*).

Nephrotoma flammeola, sp. n.

General coloration orange, the frontal prolongation of the head dark brown ; mesonotal præscutum with three shiny blue-black stripes, the median stripe narrowly split by a velvety-black line ; abdomen orange, the tergites with a median series of brownish-black triangles.

Male.—Length 13 mm. ; wing 14 mm.

Frontal prolongation of the head dark brown, including the nasus; palpi dark brown, the last segment a little paler. Antennæ elongate, if bent backward extending almost to the end of the second abdominal segment: basal segment obscure orange; second segment brown; flagellum entirely black, the segments elongate. Head obscure orange, the region of the vertical tubercle clearer, the orbital region a little darkened; occipital brand very small.

Pronotum orange, narrowly infuscated laterally. Mesonotum orange-yellow, the præscutum with three shiny blue-black stripes, the broad median stripe split by an opaque velvety-black line, the outer margin of the stripe less distinctly margined with the same colour; lateral stripes with a velvety-black spot at their anterior ends, giving the stripes the appearance of being bent outward; scutal lobes very extensively blackened; posterior margin of postnotum a little darkened. Pleura reddish yellow, variegated with clear yellow, this including the mesepimeron and a large area on the postnotal pleurotergite between the bases of the wings and halteres. Halteres pale brown, the knobs a little paler. Legs with the coxæ and trochanters orange; remainder of the legs dark brown, the femoral bases are rather narrowly paler. Wings tinged with pale greyish brown; stigma rather pale brown; a faint brown seam on the deflection of R_{1+5}; wing-base and cell *Sc* more yellowish; veins dark brown. Venation: *Rs* about two-thirds R_{2+3}, not in alignment with R_{4+5}; cell M_1 short-petiolate, the petiole about equal to *m*; cell 1*st* M_2 small, strongly narrowed distally; *m–cu* at the fork of *M*.

Abdomen orange; a series of brownish-black triangles along the median line of the tergites, extending from the posterior half of tergite 2 through tergite 8; hypopygium pale brown. Male hypopygium very obliquely truncated, the eighth and ninth sternites relatively small; outer dististyle with the outer half very slender and attenuated.

Hab. Japan (Honshiu).

Holotype, ♂, Gifu, Mino-no-kuni, May 25, 1921 (*K. Takeuchi*).

Nephrotoma subpallida, sp. n.

General coloration yellow; occipital brand lacking; præscutum and scutum marked with black; antenna of male moderately elongate, the flagellum brown, with the bases of the more proximal segments indistinctly paler; knobs of halteres yellow; abdomen orange-yellow, the tergites sparsely marked with brown.

Male.—Length 9–9·5 mm.; wing 9·5 mm.

Female.—Length 11·3 mm.; wing 10·3 mm.

Frontal prolongation of the head yellow, the nasus darker. Antennæ elongate, more than one-half the length of the body; scape yellow; basal segments of flagellum light brown; remainder of the flagellum black, the basal enlargements of segments 4 to 9 indistinctly paler. In the female, the antennæ are shorter and mostly pale. Head orange-yellow, passing into sulphur-yellow on the genæ; occipital brand lacking.

Pronotum orange-yellow. Mesonotal præscutum shiny yellow with three conspicuous shiny black stripes, the lateral pair with the anterior ends outcurved, velvety-black; lateral ends of the suture velvety-black; scutal lobes conspicuously blackened; median lobe of scutellum liver-brown; postnotum orange-yellow. Pleura orange-yellow, variegated with sulphur-yellow. Halteres brown, the knobs yellow. Legs yellow; in the male, the femoral tips narrowly dark brown; tibiæ with the tips narrowly darkened; tarsi infuscated. Wings faintly tinged with yellow, the costal and subcostal cells more suffused; stigma pale brown; veins dark brown. Venation: *Rs* shorter than R_{2+3}; cell *1st* M_2 small, elongate; cell M_1 short-petiolate.

Abdomen orange-yellow, the posterior margins of the tergites, with a triangular dark brown median area, these including segments 2 to 6; a circular spot on basal half of tergite 2; hypopygium and sternites orange-yellow. In the female, the markings are more ring-like.

Hab. Japan (Honshiu).

Holotype, ♂, Mt. Minomo, Settsu-no-kuni, June 22, 1922 (*T. Esaki*).

Allotopotype, ♀.

Paratopotype, ♂.

Nephrotoma ligulata, sp. n.

General coloration yellow; thoracic pleura conspicuously variegated with black; abdominal tergites trivittate with brownish black; eighth sternite of male hypopygium with a median liguliform appendage.

Male.—Length 8·5 mm.; wing 8 mm.

Frontal prolongation of head yellow, dorsally with a large oval brown area which includes the nasus; palpi brown, the incisures narrowly paler. Antennæ moderately elongate, when entire, probably attaining the base of the abdomen; scape light yellow; flagellum dark brown; flagellar segments only slightly incised. Head orange-yellow, the occipital brand very large, extending cephalad on to the base of the vertical tubercle.

Pronotum yellow, the sides dark brown. Mesonotal præscutum whitish yellow, with three very broad, shiny black stripes that restrict the interspaces to capillary vittæ; lateral stripes outcurved, concolorous throughout; scutum yellow, the lobes almost entirely covered by large black areas, confluent across the suture with the lateral præscutal stripes; scutellum yellow, with a capillary brown median line that is gently widened posteriorly; postnotal mediotergite yellow, with a ⊥-shaped brown mark. Propleura conspicuously dark brown. Mesopleura yellow, variegated with dark brown on the anepisternum and sternopleurite; postnotal pleurotergite darkened dorso-posteriorly. Halteres brown, the base of the stem and apex of knobs yellow. Legs with the coxæ yellow; basal half of fore coxæ and base and apex of hind coxæ dark brown; trochanters yellow; femora yellow, the tips narrowly blackened; tibiæ pale brown, the tips narrowly infuscated; tarsi brown. Wings with a faint yellow tinge, cell *Sc* and the wing-base more saturated; stigma small, oval, dark brown; very indistinct pale brown seams on *r–m* and deflection of R_{4+5}; wing-tip faintly darkened; veins brown. Venation: *Rs* one-third longer than R_{2+3}; cell *1st* M_2 elongate, almost parallel-sided; cell M_1 broad, sessile; *m–cu* close to the fork of *M*, the distance about equal to *r–m*.

Abdomen yellow, the tergites trivittate with brownish black; median stripe very indistinctly interrupted at the posterior margins of the intermediate segments; lateral stripes broadly interrupted basally; tergite 7 black, yellow basally; tergite 8 black; hypopygium brown; sternites yellow, sternites 7 and 8 black. Male hypopygium with the sternite small, black, depressed dorso-medially, the caudal margin denticulate; outer dististyle yellow, a little infuscated basally, this style not conspicuously attenuated apically. Eighth sternite with a flattened, median, tongue-like lobe, the sides parallel, the apex subtruncate and finely pubescent.

Hab. China (Mongolia).

Holotype, ♂, Vallée de la Selenga, 50 verstes au N.E. de Bandre-Koure, altitude 1225 metres, August 1909 (*Dr. du Chazaud*); Mission de Lacoste.

Type in the collection of the Paris Museum.

Nephrotoma bispinosa, sp. n.

General coloration yellow, extensively variegated with black; a broad median line on vertex; a dark area on dorso-pleural region of thorax before the wing-root; abdominal sternites with an interrupted median brown stripe; male hypopygium with the ninth tergite terminating in two acute black spines; ninth sternite with a small protuberant median lobe at the base of the notch.

Male.—Length 12·5 mm.; wing 11·3 mm.

Frontal prolongation of head brownish yellow, clearer latero-ventrally, the dorsum apically dark brown, this mark including the nasus; palpi brown, the first segment and base of the second paler. Antennæ with the first scapal segment yellow, narrowly darkened apically, second segment grey-pruinose; flagellum dark brown, the segments only moderately incised. Head orange-yellow, more sulphur-yellow anteriorly; occipital brand very conspicuous, black, sending a broad median line cephalad almost to the summit of the vertical tubercle.

Pronotum yellow, dark brown laterally. Mesonotal præscutum yellow with three shiny black stripes that are well separated from one another by lines of the ground-colour; lateral stripes strongly outcurved; scutal lobes extensively blackened, the marks confluent with the lateral præscutal stripes; outer ends of pseudosutural foveæ velvety-black; scutellum dark brown; postnotal mediotergite sulphur-yellow with a broad median black stripe that is expanded across the posterior end of the sclerite. Pleura with the propleura brownish black; conspicuous brownish-black areas on the anepisternum, occupying most of the sclerite, together with a narrow brown seam along the suture, encroaching on the cephalic margin of the epimeron; a large triangular area occupying the dorso-pleural region cephalad of the wing-root; sides of the sterno-pleurite extensively dark brown; postnotal pleuro-tergite yellow, conspicuously bordered by dark brown. Halteres pale brown, orange at base, the apex of each knob yellow, the base more infuscated. Legs with the coxæ reddish brown, more or less infuscated basally; trochanters orange; fore femora dark brown with about the basal third obscure brownish orange; posterior femora obscure brownish orange with the extreme tips darkened; remainder of legs dark brown. Wings greyish yellow, cell *Sc* more yellowish; stigma small, oval, dark brown; a conspicuous brown seam along *r–m* and the basal deflection of R_{4+5}; extreme apex of wing in cells R_3 and R_5 darkened; veins dark brown. Venation: *Rs* longer than R_{2+3}, gently arcuated; cell M_1 broadly sessile; fusion of Cu_1 with *M* some distance before the fork of the latter, the distance greater than *r–m*.

Abdomen orange, the tergites conspicuously trivittate with black, the median stripe broadly interrupted both at the base and apex of each segment; lateral stripes interrupted caudally; segments 7 and 8 dark brown, the former with a basal sublateral pale area; hypopygium reddish, the tergite black; sternites obscure orange, with a conspicuous interrupted median stripe. Male hypopygium with the ninth tergite blackened, the caudal portion cut off from the base by a semicircular impressed line, the median apical portion deeply split medially by a narrow incision; surface microscopically spinulose; from beneath the lateral margins of the tergite on either side juts a slender black chitinized spine directed caudad. Outer dististyle not conspicuously attenuate apically. Ninth sternite deeply notched medially, at the base of the notch with a small but conspicuous median lobe, directed caudad. Eighth sternite unarmed.

Hab. China (Mongolia).

Holotype, ♂, Vallée près de la Koure de Bandic, altitude 1500 metres, 1909 (*Dr. du Chazaud*); Mission de Lacoste.

Type in the collection of the Paris Museum.

Nephrotoma duchazaudi, sp. n.

General coloration yellow; terminal segment of palpus orange; propleura yellow; wings with *Rs* shorter than R_{2+3}; male hypopygium with the eighth sternite extensive, notched medially, the notch densely filled with abundant long yellow setæ.

Male.—Length about 11 mm.; wing 12·7 mm.

Frontal prolongation of head clear yellow above, including the nasus, the sides darkened; palpi light brown, the terminal segment bright orange. Antennæ of moderate length; scape yellow; the elongate first segment of flagellum light brown; remaining flagellar segments dark brown, deeply incised beneath. Head light yellow, the occipital brand large but pale brown in colour, elongate-triangular in outline.

Pronotum yellow. Mesonotal præscutum yellow, with three conspicuous black stripes, the lateral stripes straight; scutum yellow, each lobe with two distinctly separated black areas; scutellum yellow, very indistinctly darkened medially, more distinctly so behind; postnotum pale yellow with a ⊥-shaped pale brown mark. Propleura yellow. Pleura yellow, very sparsely and indistinctly variegated with reddish brown; a brown spot cephalad of the root of the halter; sides of sterno-pleurite more conspicuously darkened. Halteres pale brownish yellow throughout. Legs with the coxæ yellow, faintly darker basally; trochanters yellow; femora pale brown, the tips very indistinctly darkened; tibiæ pale brown; tarsi darker. Wings with a faint yellowish tinge, the base and cells *C* and *Sc* more saturated; stigma small, oval, dark brown; a narrow but distinct brown seam along *r–m* and the basal deflection of R_{4+5} on the distal side; wing-tip narrowly but distinctly darkened; veins brown. Venation: *Rs* straight, shorter than R_{2+3}; cell M_1 short-petiolate; fusion of Cu_1 and *M* close to the fork of the latter.

Abdomen yellow, the tergites very narrowly trivittate with dark brown; tergite 8 and caudal half of 7 dark brown; sternites yellow, with a series of linear brown dashes on the basal half of the segments; hypopygium yellow. Male hypopygium relatively large. Ninth tergite massive, the caudal margin with a relatively small semicircular median depression, the slopes highly polished; caudo-lateral angles of this depressed area produced into large yellow lobes that are separated by a narrow median notch, the surface provided with numerous black spines and spinous bristles, the more lateral one a conspicuous enlarged tubercle. Outer dististyle with the apex conspicuously long-attenuate, the margins provided with long yellow setæ. Ninth sternite with a small pendulous lobe in the notch, somewhat as in *N. bispinosa*, but more bifid at apex. Eighth sternite dark basally, very extensive, deeply notched medially, the notch filled with abundant dense yellow setæ, decussate across the median line; dorso-caudal angles of sternite produced slightly mesad and here provided with long yellow setæ.

Hab. China (Mongolia).

Holotype, ♂, Bords du Tarim, July 1909 (*Dr. du Chazaud*); Mission de Lacoste.

Type in the collection of the Paris Museum.

Nephrotoma rectispina, sp. n.

General coloration yellow; thoracic stripes black, the lateral stripes straight; wings tinged with yellow, the tip and a seam along the cord brown; abdominal tergites trivittate with dark brown; male hypopygium with two long straight spines jutting caudad from the genital chamber.

Male.—Length 13·5 mm.; wing 12·8 mm.

Frontal prolongation of head yellow, the apex medially, together with the nasus, brown; palpi pale brown, the last segment and mouth-parts yellow. Antennæ moderately elongate, if bent backward extending to beyond the base of the abdomen; scape yellow; flagellar segments bicolorous, the basal enlargement dark brown, the remainder of each segment yellow, except the anterior or ventral face which is infuscated. Head orange; occipital brand brown, small, but sending a brown line cephalad on to the vertex.

Pronotum yellow. Mesonotal præscutum shiny yellow, with four narrow dark brown stripes, the intermediate pair sometimes confluent except anteriorly; lateral stripes straight; scutum yellow, the lobes with the cephalic half dark brown; scutellum light yellow; postnotum with the mediotergite brown, the cephalic half with an extensive yellowish median area. Pleura white, variegated with yellow, the white areas including the postnotal pleurotergite except the infuscated dorsal angle. Halteres pale brown, the knobs indistinctly yellowish. Legs with the coxæ testaceous-yellow; trochanters yellow; femora brownish yellow, narrowly tipped with black; remainder of legs broken. Wings tinged with yellow; cells *C* and *Sc* more strongly yellow; stigma small, oval, dark brown; wing-tip narrowly darkened; a narrow but conspicuous brown seam along the cord, slightly obliterated at the fork of *M*; veins dark brown. Venation: cell M_1 very short-petiolate; fusion of *M* and *Cu* a little less extensive than the free portion of *M* beyond this.

Abdomen yellow, the tergites with a broad median and very narrow lateral brownish-black stripes that are narrowly interrupted at the bases of the segments; tergite 1 brown, pale yellow medially and laterally; tergite 7 brownish black, yellow sublaterally at base; tergite 8 brownish black; sternites yellow, with a median brown stripe; hypopygium shiny obscure yellow. Male hypopygium with the ninth tergite terminating in a small conical lobe on either side, the space between these lobes gently convex and provided with abundant black spinules. Outer dististyle not unusually attenuated, yellow. What seem to be the gonapophyses jut caudad from the genital chamber as long yellow spines, these straight or nearly so, lying generally parallel, the acute tips narrowly blackened and directed gently mesad. Eighth sternite unarmed.

Hab. China (Kwei-chow).

Holotype, ♂, Anshoufu, Gan Chouen Fou, 1912 (*Père Cavalerie*).

Paratopotype, ♂.

By Riedel's key to the Palæarctic species of the genus (Deutsch. Ent. Zeitschr. 1910, pp. 413–417), the present form runs to *N. lamellicornis* (Schummel) or *N. schummeli* (Riedel), very different flies.

XLI.—*Two new Genera and a new Species of Oriental* Hypeninæ (Noctuidæ). By Sir George F. Hampson, Bart.

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[In view of the fact that these names, which exist with the descriptions in manuscript in the British Museum, are required for immediate use, it is considered advisable to publish them at once.—W. H. T. Tams.]

Genus Raphiscopa, nov.

Type, *R. invenusta*.

Proboscis fully developed; palpi of male with the 1st joint upturned to about middle of frons and rather broadly scaled in front, the 2nd and 3rd recurved over head and extending to beyond the metathorax, the 2nd the shorter and broadly scaled above, the 3rd hollowed out on inner side and containing a tuft of hair; frons smooth; eyes large, round; antennæ of male with long bristles and cilia, the shaft contorted and with tuft of hair above at about two-thirds length; thorax clothed with hair and scales mixed and without crests; fore tibiæ and 1st joint of tarsi of male covered by a thickly scaled sheath enclosing fringes of hair, the mid and hind tibiæ with slight tufts of hair at middle and extremity; abdomen with some rough hair at base of dorsum, but without crests. Fore wing with the costa arched towards apex which is somewhat produced, the termen evenly curved, crenulate; vein 3 from well before angle of cell; 5 from just above angle; 6 from below upper angle; 7 from angle; 8, 9, 10 stalked; 11 from cell. Hind wing with the cell about one-third length of wing; veins 3, 4 from angle; 5 fully developed from well above angle; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

Raphiscopa invenusta.

Bertula invenusta, Swinh. Ann. & Mag. Nat Hist. (7) ix. p. 177 (1902), ♂.

♂. Head and thorax red-brown mixed with some dark brown, the antennæ grey-brown above, dark brown below; abdomen grey-brown, the anal tuft whitish tinged with brown; tarsi fuscous, the tibiæ at extremities and tarsi ringed with whitish. Fore wing red-brown mixed with black-brown, the antemedial area to median nervure, the postmedial area to vein 5, and the terminal area suffused with black-brown; a sinuous rufous subbasal line defined on each side by black from costa to submedian fold; antemedial line rufous defined on outer side by black towards costa, angled outwards below costa, then waved; a white point in middle of cell and curved discoidal striga defined by black-brown; postmedial line rufous defined on each side by diffused black, slightly bent outwards below costa, then slightly waved and angled inwards at submedian fold; subterminal line whitish, incurved below costa, at discal fold and below vein 3, excurved at veins 7, 6, 4, 3; a terminal series of black lunules and fine whitish line at base of cilia. Hind wing fuscous-brown, traces of dark postmedial and subterminal lines except towards costa, the former faintly defined on outer side by whitish, the latter on inner side; a terminal series of black lunules and fine whitish line at base of cilia. Underside pale red-brown; both wings with blackish discoidal bar, waved postmedial line, and waved whitish subterminal line defined on each side by diffused fuscous-brown, on fore wing almost obsolete except towards costa.

Hab. SUMATRA, 1 ♂ type. *Exp.* 46 mm.

Genus BLEPTINODES, nov.

Type, *B. perumbrosa*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to above vertex of head, moderately scaled in front and smoothly behind, the 3rd rather long, with large tuft of hair behind; frons smooth; eyes large, round; antennæ of male with long bristles and cilia; thorax clothed with scales and hair mixed and without crests; fore tibiæ covered by a thickly-scaled sheath, the mid and hind tibiæ smoothly scaled; abdomen smoothly scaled without crests. Fore wing with the costa moderately arched, the apex rounded, the termen evenly curved and not crenulate; vein 3 from well before angle of cell; 5 from just above angle; 6 from upper angle; 7, 8, 9, 10 stalked; 11 from cell. Hind wing with the cell about half the length of wing; veins 3, 4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

Bleptinodes perumbrosa.

Nodaria perumbrosa, Hmpsn. J. Bomb. Nat. Hist. Soc. xi. p. 700 (1898).

Head and thorax black-brown with a cupreous gloss; abdomen fuscous-brown; pectus and legs fuscous-brown, the tarsi ringed with white. Fore wing black-brown slightly tinged with grey; antemedial line blackish defined on inner side by brownish grey, oblique, waved; a rounded dull rufous discoidal spot; postmedial line blackish defined on outer side by brownish grey, excurved below costa and beyond lower angle of cell, incurved at discal fold, incurved and waved below vein 3, and angled outwards at vein 1; subterminal line brownish white defined on inner side by blackish, rather diffused, excurved between veins 8 and 6 and at middle, incurved at discal fold and below vein 3; a terminal series of small black spots with brownish-white marks beyond them at base of cilia. Hind wing uniform fuscous-brown. Underside grey-brown; fore wing with the costal area irrorated with whitish, an oblique brownish-white postmedial bar from costa; hind wing with small blackish discoidal lunule and indistinct rather diffused curved postmedial and subterminal lines.

Hab. Assam, Khásis, 1 ♂, 1 ♀ type. *Exp.* 34 mm.

Bertula leucopis, sp. n.

♂. Head and thorax red-brown, the antennæ grey-brown, the 3rd joint of palpi with some black-brown scales and the tuft of hair red-brown; abdomen pale red-brown tinged with grey and with some whitish at base and in the anal tuft; pectus and ventral surface of abdomen white suffused with red-brown; legs red-brown above, white below, the tarsi ringed with white. Fore wing red-brown tinged with grey, especially on terminal area; antemedial line black defined on outer side by whitish at costa, then almost obsolete; a white point defined by black in middle of cell and black discoidal lunule with a black point beyond its upper extremity and two beyond its lower; a rather diffused incurved red-brown line from lower angle of cell to inner margin; postmedial line brownish white defined on inner side by a brown line and on outer by diffused black-brown, erect to vein 4, then incurved; subterminal line whitish, waved to vein 6 and below vein 2, reduced to points at middle; a terminal series of minute black lunules and a fine whitish line at base of cilia. Hind wing whitish suffused with reddish brown; a whitish subterminal line from vein 3 to termen; a terminal series of slight blackish lunules to vein 2, and white line at base of cilia. Underside of fore wing pale red-brown, the inner area whitish, a blackish discoidal striga, postmedial striga from costa defined on outer side by whitish, and sinuous whitish subterminal line to vein 6; hind wing whitish suffused and irrorated with red-brown, except on inner area, a black-brown discoidal lunule, sinuous brown postmedial line, and whitish subterminal line faintly defined on inner side by brown and somewhat excurved at middle.

Hab. C. CHINA, Ichang (*Mrs. Pratt*), 1 ♂ type; BORNEO, Sarawak, Busan, 1 ♂. *Exp.* 30 mm.

XLII.—*On the Habits of an Octopus* *.

By W. K. FISHER, Hopkins Marine Station, California.

[Plate XXVII.]

IN June 1924 a small octopus captured near the Hopkins Marine Station, Monterey Bay, California, was placed in an aquarium, and lived until November 7, 1924. It was given a cylindrical stone jar 5 inches high, having an aperture of 2¼ inches. For two weeks, however, it preferred a narrow cavity under a rock. Every night the stone jar was moved over the sandy floor of the aquarium and left in a different place. During this period the octopus ate rather greedily of fish, crab, and mollusc (*Haliotis*).

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* See "Brooding-habits of a Cephalopod," Ann. & Mag. Nat. Hist. ser. 9, vol. xii., July 1923, p. 147, pl. v. The subject of the present notes was a little smaller than "Mephista," but, apparently, the same species—*Polypus apollyon*, Berry—or closely related form.

During the second week of July "Mephista II." moved permanently into the stone jar, which rested on its side, and constructed a barricade of shells and small stones. These filled the outer half or two-thirds of the jar. Some time between July 15 and 20 she began to deposit eggs on the bottom of the jar, which was, of course, in a vertical position. The eggs were brooded in the manner already described and figured (*loc. cit.*). In all about fifty clusters were deposited during at least a week, or, perhaps, longer, as it was impossible to ascertain certainly when egg-laying ceased.

A week later development had very evidently begun in the eggs examined (July 28). By August 20 the rudiments of eyes and tentacles were manifest. On September 4 the visceral sac had greatly increased in size, being about as large as the yolk-sac. On September 9 the yolk was smaller than the visceral sac; the chromatophores had made their appearance and showed slight movement. By September 14 the embryos exhibited respiratory reactions and the chromatophores were in active movement. The first eggs hatched September 19, in dishes into which detached clusters had been placed for observation. From September 21 to September 24 the greater number hatched, while a few—probably the last to be deposited—were delayed for several days longer.

Although offered the food which she had taken prior to retirement into the jar, the octopus refused to eat, nor was she ever observed to leave her shelter. The barricade of shells and pebbles had to be removed in order to reach the eggs which she was covering. This barricade was in all but one instance replaced by the observer (and later rearranged by the occupant). When the barrier was omitted a new one was found in the morning. After the eggs had nearly all been removed and the few remaining clusters had hatched (by September 26) the octopus maintained its position and refused to eat. Later the obstruction was permanently removed, but still she avoided food. When she finally died at her post—November 7—she had quite visibly shrunken in size, as in the case of "Mephista I." Possibly during the post-brooding period the food reaction is specialized—that is, limited to relatively few things. I find it hard to believe that in *Polypus* death is a normal sequel to egg-laying.

On hatching the young are commonly 2·5 to 2·8 mm. long. The arms are relatively small and the body-form different from that of the adult (Pl. XXVII. figs. 1, 2). The visceral sac is translucent, and when the large chromatophores are contracted some of the internal organs are readily seen. The beating of the systemic and branchial hearts may be observed. The "otocysts" are conspicuous. As soon as the young are free from the egg-capsule they swim about actively by expelling water from the mantle-cavity, and come to rest on the bottom of the dish. The process of hatching is rather exhausting.

The embryos are oriented sometimes with the head toward the base of the egg, rather less often in the opposite direction. Apparently the squirming pressure of the posterior end of the young causes the capsule to split slightly. By vigorous expansions and contractions of the mantle the body is forced out through the opening, which may be at the distal end or at one side of the proximal end of the capsule (figs. 3, 4, 5). I observed no case out of several hundred in which the first split occurred otherwise than described. The escape from the shell proceeds rather rapidly until the visceral sac and funnel are free. The somewhat elastic egg-shell seems to close around the head, behind the eyes, and the animal has to struggle violently to extricate itself. This final stage may occupy from ten to forty minutes, during which water is violently expelled from the mantle-cavity. The body is twisted and the chromatophores expand and contract continually, except during brief periods of rest. The head is frequently forced free by a sharp flexure of the body ventralwards and forwards—much more so than in figure 5. Sometimes the head comes free after indifferent squirming movements. In one case during the struggle the young discharged ink into the capsule. Often the yolk-plug is broken off and is left inside the capsule (figs. 4, 6). I observed an instance in which the capsule closed around the neck of the yolk-sac and held the animal prisoner until it succeeded in leaving the yolk behind.

The young are pre-eminently swimmers. Occasionally they exhibited very slight positive phototactic reactions to strong light, at other times no reaction was evident.

I was unable to keep them alive for more than three or four days after hatching. They refused to partake of crushed fish, crab, or mollusc meat. Even the presence of a tiny bit of yolk over the mouth did not appear to contribute to viability.

Pacific Grove, California.

EXPLANATION OF PLATE XXVII.

Polypus apollyon, young.

Fig. 1. Side view of young, just hatched, the mantle fully relaxed; chromatophores contracted.
Fig. 2. Ventral view of another specimen; the chromatophores omitted.
Fig. 3. Young breaking egg-shell.
Fig. 4. Young partly out of shell; siphon still inside; yolk-plug loose in capsule.
Fig. 5. Young emerging at proximal end of egg-shell.
Fig. 6. Young struggling to free head held fast by egg-shell; mantle contracting violently; chromatophores largely expanded. The yolk has broken loose.

Reference-letters:—*a*, yolk; *b*, peduncle attaching egg to central axis of cluster; *c*, mantle; *d*, funnel expelling water; *e*, otocysts.

All figures × 20.

XLIII.—*On some Scorpions from Morocco, with the Description of a new Genus and Species.* By STANLEY HIRST.

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BUTHEOLOIDES, gen. nov.

Carapace fairly level, not sloping in front, without any trace of keels. Abdominal tergites with a single median keel. Lower surface of caudal segments entirely without keels. Lower edge of immovable finger of chelicera with two little denticles. Tarsal spurs on both third and fourth legs.

Butheoloides maroccanus, sp. n.

♀?—*Colour* (in spirit). Carapace blackish brown; abdominal tergites (with the exception of the last one) blackish brown, but they have a yellowish patch posteriorly, giving the appearance of a pale median stripe. First three caudal segments yellow, fourth and fifth segments blackish brown, vesicle yellow, but its sting darkened. Palp mostly yellow, but very slightly infuscate in places; the fingers slightly darkened. Legs yellow, but the femora and tibiæ slightly infuscate. *Carapace* without keels; surface in front of ocular tubercle rather smooth and shiny; ocular tubercle itself practically smooth above; the rest of the carapace very finely granular. Only the median keel present on *abdominal tergites* (with the exception of the last tergite, which has paired lateral keels). Tergites shiny, but close inspection reveals rather fine granulation. *Sternites* smooth and shiny. *Tail* fairly slender and not enlarged posteriorly, the vesicle of normal shape and size. Caudal segments 1–3 with the upper dorsal keel distinct; in the fourth segment this keel is indistinct, being lost amongst the granulation; inferior dorsal keel distinct in the first segment, but it can only be distinguished with difficulty in the second and third segments, being weak and confused with numerous granules. Ventral and lower part of lateral surfaces of caudal segments 1–4 smooth and shiny, being without trace of keels or granulation; a number of scattered punctations of moderate size are present ventrally, however. Fifth caudal segment without any trace of keels, even the dorsal ones being absent; on its ventral surface this segment is furnished with minute granules intermingled with punctations, the latter being more numerous than on the anterior segments. Vesicle almost smooth, the punctations and granules on its surface being very fine; there is a very minute blunt peg-shaped thorn below the sting. Hand of *palp* fairly thick, smooth and polished, only a few scattered punctations being visible. Movable finger considerably longer than the underhand; its edge is furnished with ten rows of granules, not including a very short apical row; each of these rows of granules terminates externally at the basal end in a pair of enlarged granules; on the inner side there is an isolated unpaired granule situated opposite the middle of each row of granules. Pectinal teeth 15 in number.

Length 22 mm.

Locality. Amizmiz, Morocco (*Alluaud*). Museum of the Chérifien Scientific Institute at Rabat. A single specimen.

Buthus europæus, L.

Buthus europæus, L. (syn. *B. occitanus*, Amor.), seems to be the common scorpion of Morocco. The granulation of the median ventral keels of the second and third caudal segments is very variable; examples with the granules of these keels enlarged posteriorly and others with these granules uniform throughout the length of the segments and not enlarged are present in nearly every batch of specimens of this scorpion from Morocco. It seems quite clear, therefore, that *B. atlantis*, Poc., is merely a synonym of *B. europæus*. The coloration of *B. europæus* is very variable. Specimens from Morocco are sometimes quite pale yellow, the dorsum, however, often darker; other specimens are brownish yellow; whilst a couple of examples from Rabat are exceptionally dark, being very deep brown. In the British Museum Collection there are two specimens of *B. europæus* from Rio de Oro (Riggenbach Coll.) which are especially interesting, for the last caudal segment and the vesicle are black; I propose the name ***nigrovesiculosus*** for this variety. Some specimens from the Trarza Country, north of Senegal, are quite typical in colour and granulation. Specimens of *B. europæus* from the following localities are present in the collection of the Institut Scientifique Chérifien at Rabat:—Timhadit; Mogador (*Alluaud*); Azemmour (*Alluaud*); Oued-Ykem (*Alluaud*); environs of Rabat (melanistic form) (*Alluaud*); Ain-Leuh; Aït Attab; Targa Imoulay; Si Chahamarouch; between Tamanar and Agadir; Amizmiz (*Alluaud*); Tangier; Davet er Roumi; El Agreb; Ile Reraya; Boulhaut; Kasba-Tadla; Agadir; Demnat (*Pallary*); Mazagan; Tiznit; Kenitra; de Salé à Kenitra.

Buthus europæus, L., var. *nigrovesiculosus*, nov.

Chiefly distinguished by the blackish fifth caudal segment and blackish vesicle, the rest of the body and limbs being pale yellow. The smaller specimen has the median ventral keels of the second and third caudal segments strongly enlarged, but they are only slightly enlarged in the larger specimen. Keels of carapace rather weak, the anterior keel being much weaker than usual. Hand narrow, the hand-back being almost twice the width of the hand. The larger specimen, which is a male, has thirty-six pectines on each side.

Length (from front of carapace to end of sting) 55 mm.

Locality. Boste, Rio de Oro; two specimens (Riggenbach Coll.).

Buthus bicolor, var. *mauritanicus*, Poc.

Localities. Rabat (*Alluaud*); Cape Ghir; Amizmiz (*Alluaud*); Agadir (*Pallary*); Dar Kaïd Embarek (*Pallary*). Also specimens in the British Museum from East of Mogador, Feb. 1905 (Riggenbach Coll.).

XLIV.—*Description of a new Species of* Gnathia (*Crustacea, Isopoda*) *from South Africa.* By K. H. BARNARD, M.A., F.L.S., F.R.S.S.Afr.

(Published by permission of the Trustees of the S. African Museum.)

IT is thought desirable to publish the description of this new species of *Gnathia* in order that it may be included in the forthcoming monograph on this family by M. Th. Monod of the Paris Museum.

Gnathia cryptopais, sp. n.

Male.—Head smooth, dorsally concave in front, anterior margin with a large semicircular crenulate lobe. Antero-lateral angles shortly but acutely produced. Eyes not very prominent.

Peræon segments 2 and 3 subequal in length, a short constriction between segments 3 and 4; segments 4–6 subequal in length, with only shallow grooves separating them, lateral margins and postero-lateral angles of segment 6 rounded; no median longitudinal depressions.

Pleon shorter than peræon segments 4–6 together.

Telson with lateral margins slightly concave, apex acute.

Lateral margins of peræon and pleon segments with moderately numerous outstanding setæ.

First antenna: third joint of peduncle longest, flagellum 4-jointed.

Second antenna subequal to first, ultimate peduncular joint longest, flagellum 5-jointed.

Mandible narrow, apex acute, outer margin with a very indistinct tooth, inner margin biconcave, the basal concavity matching the median lobe of head when the mandible is closed.

Maxilliped: second joint strongly produced on inner distal margin, exceeding the first palpal joint, fourth palpal joint not incurved.

First peræopod broadly subtrigonal, inner and outer margins both convex.

Second to sixth peræopods very feebly tuberculate.

Pleopods with two hooked setæ on peduncle, rami narrow and subequal.

Uropod: outer ramus narrower and shorter than inner, both with simple setæ.

Length 2 mm.

Colour in spirit whitish, eyes reddish.

Locality. Dammy Point (off Saldanha Bay), E. by N. ½ N., distant 8 miles, 87 fathoms.

1 ♂, 1 juv., S.S. 'Pieter Faure,' 17/3/02. (S.A.M. reg. no. A 6051.)

This species is very closely allied to *G. cerina*, Stimpsn., judging by Miss Richardson's figures in the 'Monograph of N. American Isopods,' 1905, p. 60. The body, however, is perfectly smooth, not granulate as in fig. 43 copied from Harger, and there is no longitudinal groove on segment 5. The mandible also is distinctly biconcave, not as in Miss Richardson's figure concave only in the distal half of the inner margin. The Cape species, therefore, may claim for the present specific distinctness.

It is distinguished from *G. richardi*, Dollf., 1901, by its broader head and peræon and by the presence of the acute antero-lateral angles of the head. The frontal lobe is more prominent and semicircular. The mandibles, however, of the two species are very similar.

An interesting point about the larva is that it is completely enclosed, except the mouth-parts and front part of the head, in a covering of Monaxonid sponge-spicules, the pleon being doubled up under the peræon in Brachyuran fashion. This coating seems to have been constructed by the animal, as it does not have the appearance of being a self-grown sponge. The specific name refers to this peculiarity.

XLV.—*A new Genus of Cavy from Catamarca.*

By Oldfield Thomas.

Among a collection of small mammals obtained in Catamarca, N. Argentina, and presented to the National Museum by Mr. S. Shipton, there occur two specimens of a small cavy related to *Caviella* and *Monticavia*, and to a certain extent annectant between them. It shows, however, such characters of its own, besides a combination of those found in the other two genera, that it should apparently be considered as a peculiar genus, which might be called *Nanocavia*.

The two known genera above referred to differ from each other as follows:—

Caviella.

Feet normal.

Skull of approximately normal shape. Lacrymals of average breadth. Frontal processes of premaxilla fairly broad. Posterior palatal opening widely angular. Fossa outside tooth-row of lower jaw very deep, especially deepened anteriorly.

Incisors orthodont or but little proodont. Last upper molar with a deep notch on inner side at the front end of the comparatively long posterior lobe.

MONTICAVIA.

Feet unusually thickened and lumpy, contrasted with the slender wrists and ankles.

Skull of quite abnormal shape, strongly bowed, convex above. Lacrymals peculiarly broadened. Premaxillary processes narrow, thread-like. Posterior palatal opening rounded, semicircular. Fossa of lower jaw not specially deepened.

Incisors proodont. Posterior lobe of m^3 quite short, without antero-internal notch.

Both genera have their bullæ large, and distinctly inflated behind as well as in front, and the meatus is quite short and points outwards and upwards.

Now the new genus, *Nanocavia*, has a mixture of the above characters, as follows:—

Feet as *Monticavia.*

Skull of normal shape, as *Caviella*, not specially bowed. Lacrymals and premaxillary processes normal. Posterior palatal opening broadly angular. Fossa of lower jaw not deepened.

Incisors proodont, unpigmented. Posterior lobe of m^3 short, not notched internally.

The bullæ differ from those of both the other genera by being quite small, and the part which appears on the occipital surface is practically uninflated. Meatus comparatively long, and directed backwards as well as outwards and upwards.

Genotype: *Nanocavia shiptoni*, sp. n.

It will be seen what a curious mixture the new genus presents of the above characters, these being all of considerable structural importance; while the general shape of the skull, absolutely *Caviella*-like, would alone separate it from *Monticavia* and the teeth from *Caviella*. The small bullæ, scarcely inflated behind, are peculiar to itself.

Nanocavia shiptoni, sp. n.

Size small, the smallest known cavy. Fur thin and poor.

General colour above dull brownish buffy, slightly browner than in *Monticavia niata*, to which there is a strong general resemblance. Under surface buffy whitish, the bases of the hairs brownish slaty. Ears short, well clothed with fine buffy hairs. Hands and feet pale buffy, stronger buffy terminally; the feet thick and lumpy, as in *Monticavia*.

Skull as described above. Premaxillæ well pushed forward *, the incisors proodont, with an incisive index of 111°. Nasals nearly parallel-sided. Brain-case smooth and little ridged, but neither of the specimens very old. Palatal foramina of medium size, triangular. Choanæ widely angular, the angle slightly more than a right-angle. Bullæ very small, much smaller than in any of the allied forms; a well-marked small vacuity below the base of the meatus.

Dimensions of the type:—

Head and body 220 mm.; hind foot 37.

Skull, greatest length 45 mm.; condylo-incisive length 41; zygomatic breadth 27; nasals 15·5 × 7·2; interorbital breadth 10·5; palatilar length 19·5; palatal foramina 5·5 × 2·5; bullæ (in a straight line forward from the front of the paroccipital process) 9; upper tooth-series 11·7.

Hab. of type. Laguna Blanca, Catamarca. Altitude 3400 m.

Type. Adult female. Original number 163. Collected 22 December, 1918, and presented by S. Shipton, Esq. Two specimens.

This little animal, the smallest cavy known, is a most interesting discovery, and I have much pleasure in naming it after its captor, Mr. S. Shipton, whose ornithological work is well known, and who has now presented the National Museum with the considerable collection of small Mammals in which it occurs. He also obtained in Catamarca the rare *Abrocoma cinerea*, previously only recorded from Jujuy, and a number of other welcome accessions to the Museum.

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* I find that the expression used in my paper on the forms of *Caviella* (Ann. & Mag. Nat. Hist. (9) vii. p. 445, 1921): "Incisors visible (or not visible) from above in front of the nasals" is a bad one, owing to its being liable to misunderstanding if the skull is held in the hand, and oriented by the frontal surface, as is not unnatural. To get the character correctly the skull must be laid on a flat surface, and then looked at vertically.

BIBLIOGRAPHICAL NOTICES.

Handbook of the British Flora. By George Bentham, C.M.G., F.R.S., and Sir J. D. Hooker, K.C.S.I., F.R.S. 7th edition revised by A. B. Rendle, D.Sc., F.R.S. 8vo. Pp. xxi, 606. London: L. Reeve, 1924. Price 12s.

Illustrations of the British Flora. Drawn by W. H. Fitch, F.L.S., with Additions by W. G. Smith, F.L.S., and others. 5th revised edition. 8vo. Pp. xxvii, 338, with 1321 figs. London L. Reeve, 1924. Price 12s.

In the Preface to the original edition of his Flora, Bentham stated clearly the object he had in view in adding to the number of British Floras. His aim was to produce a work which should enable persons having no previous knowledge of Botany to name the wild flowers they might gather in their country rambles. His handbook was for the amateur botanist, not the critical worker. Bentham also considered that the views originally entertained by Linnæus of what really constitutes a species were far more correct than the more limited sense in which modern botanists use the term. Bentham's views were strictly respected by Hooker when preparing a new edition, and the present edition still remains Bentham's Handbook. The critical student of British plants has other handbooks for his use; the beginner will still find Bentham a most helpful guide for naming his plants.

In the present edition the botanical names of the plants have been brought into accord with modern views of nomenclature, and species which have been discovered, either native or introduced, during the last thirty years have been added. A few changes have been made in the general system of classification, especially in the Ferns, to bring this more in accord with modern knowledge, and the etymology of the generic names and indications of the pronunciation of the names of genera and species have been added.

The 'Illustrations' have been similarly revised, and figures of the additions to the 'Handbook' have been included. The analytical key to the families and anomalous genera, as given in the Handbook, has also been added.

In Southern Seas. Wanderings of a Naturalist. By W. Ramsay Smith, M.D., D.Sc., F.R.S.E. With Illustrations. London: John Murray, Albemarle Street, W. 1924.

This brightly written and highly attractive book embodies the narrative of the holiday excursions of an Australian doctor to the tropical island group lying nearest to that continent; to Hong-Kong by way of the Great Barrier Reef and Port Darwin; and nearer at hand, to the breeding-grounds of the pelican, the black swan, and other interesting forms of bird life on the shores of that extraordinary South Australian lagoon known as the "Coorong." On the whole, the work appeals most directly to the anthropologist, but many interesting points in zoology and botany which came under the writer's notice in the course of his journeys are dealt with in a pleasant and convincing manner, while the chapters devoted to the life-history of the few Australian aborigines who still remain more or less in their primitive state are full of interest. Even more suggestive is the description of the aspects of Nature and Man in New Caledonia and the New Hebrides; the last-named islands are, according to our author, a veritable tropical paradise, though still unsafe in parts from the truculent character of the natives. The many excellent illustrations add greatly to the value of the book, and the writer's account of his adventures, not to mention the difficulties experienced in obtaining the photographs from which these are reproduced, is by no means the least interesting chapter.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 25th, 1924.—Dr. J. W. Evans, C.B.E., F.R.S., President, in the Chair.

The following communication was read:—

'The Development of *Leptoplastus salteri* Callaway, and of other Trilobites (Olenidæ, Ptychoparidæ, Conocoryphidæ, Paradoxidæ, Phacopidæ, and Mesonacidæ).' By Frank Raw, B.Sc., F.G.S.

Leptoplastus salteri occurs in the Upper Tremadoc horizon of Shineton Brook (Salop). All stages of development are noted, except the protaspis.

The development is divided into successive stages, named as follows:—

Stage.	Number of segments in thorax.
(iv) Autospecific stage	12
(iii) Autogeneric stage	9 to 11
(transition)	7 to 8
(ii) Ctenopleural stage	3 to 6
(overlap)	3
(i) Heptacicephalic stage	1 to 3

Stage i.—The heptacicephalic stage resembles *Olenelloides armatus* Peach, in the axial elongation of all its segments, narrowness of its pleural lobes, and in possessing three pairs of head-spines. Of these, the anterior and posterior pairs, forming the antero-lateral and postero-lateral angles of the cranidium, disappear later; while the middle pair, on the free cheeks, become the genal spines.

Stage ii.—The ctenopleural stage possesses the generalized characters of the genera *Ctenopyge* and *Sphærophthalmus*.

Stage iii.—The autogeneric stage resembles the more primitive species of *Leptoplastus*: for instance, *L. ovatus* Angelin.

Stage iv.—The autospecific stage has the adult characters of *L. salteri* Callaway.

The earliest stage has a long, simply segmented glabella; long pleural spines occur throughout the body, including three pairs on the head and four on the pygidium; while axial spines occur from the occipital segment throughout. In the last stage the glabella is short, conical, and smooth, of pleural spines, only the genal remain on the head, those in the thorax are reduced, and none remain on the pygidium, where axial spines are also wanting.

With certain reservations, these four stages are also claimed to represent successive stages in the phylogeny.

This ontogeny sheds much light on that of other trilobites, and in this way helps to reveal both their structure and their relationships.

The imperfect larval stages of other Cambrian Olenidæ agree with those of *L. salteri*, but do not reveal the anterior head-spines. They probably had a similar ontogeny. The later *Triarthrus becki* shows itself to be an Olenid.

When other trilobite ontogenies are reviewed, persistent family characters are found to mark the glabella; but all derive from a heptacicephalic ancestor. The three pairs of head-spines have in general, in the phylogeny, been reduced to one pair of genal spines. But these may be the 'posterior' pair, as in Beecher's 'Proparia'; or the 'middle' pair, as in his 'Opisthoparia'; or the 'anterior' pair, as the Author claims for the *Olenellus* family or Mesonacidæ.

The mode of life of many trilobites favoured the presence of genal spines at the postero-lateral angles of the cephalon, but only in proparial trilobites is the posterior pair retained in that position. The development of the 'middle' pair, or of the 'anterior' pair as the genal spines, involved their backward revolution through half or the whole of the length of the head respectively; at least in the phylogeny, if not still in the ontogeny. In this respect the 'Proparia' are the more primitive, and the Mesonacidæ the most specialized.

Accordingly, in the ontogenies of several families, it is the primitively posterior head-spines that at first are dominant—to be superseded later by the middle pair. In Mesonacidæ these again are succeeded by the anterior pair, which, in their lateral revolution, carried before them the anterior branches of the facial sutures, so that these cut the posterior border; they also stretched out the antero-marginal suture to the genal angle. These changes led to the supersession of the dorsal facial suture by the marginal suture, with consequent ankylosis along the former The family is hereby claimed to have a head-structure not hitherto recognized. It illustrates a general principle—that those only of the cephalic sutures are retained as were necessary for ecdysis. Similarly, the hypostomial suture in both *Paradoxides* and the Mesonacidæ is suppressed in presence of the antero-marginal suture.

In Paradoxidæ, '*Hydrocephalus*' is claimed to be a specialized larval form of the more highly evolved or short-eyed *Paradoxides*, and to differ widely in glabella from the corresponding ancestor. In Barrande's work the ontogenies of the short-eyed *P. bohemicus*, and *P. spinosus* can be traced from '*Hydrocephalus saturnoides*' and '*H. carens*' respectively, and the development of the more primitive long-eyed *P. rugulosus* from a more primitive larva figured by Raymond.

With these families the Author associates the proparial Phacopidæ, in which, following the loss of both 'anterior' and 'middle' pairs of head-spines, the connecting sutures (instead of the hypostomial) have been suppressed. The larval *Dalmanitina*, a Phacopid, resembles the more primitive type of *Paradoxides* larva.

The Ptychoparidæ and Conocoryphidæ in ontogeny greatly resemble one another. Their close relationship and the presence of eyes in more primitive trilobites suggest that in the Conocoryphidæ the eyes have aborted, and that this family descends from the Ptychoparidæ.

Similar to these families, especially in glabella-form, are the proparial Menomonidæ described by Dr. C. D. Walcott. The close resemblances force the conclusion that the three families (and the Calymenidæ), though including 'Opisthoparia' and 'Proparia', form a single natural order of trilobites.

The combined study of trilobite ontogeny and morphology strongly suggests, as Beecher claimed, that here the ontogeny extensively recapitulates the phylogeny; and therefore best indicates relationships. This indicates an early divergence in glabella-form, antedating divergences in cephalic spines and sutures. Members of a 'natural' order may, therefore, be expected to agree much more in glabella-form than in the cephalic suture, which has latterly been made the basis of classification.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY

[NINTH SERIES.]

No. 88. APRIL 1925.

XLVI.—*Additions to the* Curculionidæ *of Costa Rica and Panama* [*Coleoptera*]. *By* G. C. CHAMPION, F.Z.S.

MESSRS. STAUDINGER and Bang-Haas have sent me for determination a large number of Costa Rica and Panama weevils, mostly from Turrialba, whence very little material had been received by the Editors of the 'Biologia' when the four volumes of the Curculionid-section of the Coleoptera were completed, in 1911. The owners of this collection having allowed me to retain uniques and duplicates for the British Museum, one new genus and twenty-one new species represented in the series examined are here described. Two others provisionally identified by me in a supplementary list of localities issued in 1910 are renamed, the available material at that time being insufficient for the accurate definition of these insects. The total number of additions to the Costa Rican fauna, including four species known to me from other sources, is 108, and a complete list of them is appended herewith. Many of these insects inhabit the adjacent regions of Panama, and a few others have been recorded from the more northern portions of Central America. The numbers preceding the names of the new species indicate their position in the arrangement adopted in the various volumes of the 'Biologia.'

The new species described are as follows :—

OTIORRHYNCHINÆ.

Exophthalmus cuprirostris.
Chauliopleurus viridisquamans.
Decastichа tricostata *.
Pseudocyphus squaminasus.

CURCULIONINÆ.

Group HYLOBIINA.

Hilipus turrialbæ.
„ picticollis.
Ischiomastus carinifer †.
„ extensus *.
„ underwoodi †.

Group CHOLINA.

Cholus stellatus.
„ orosiensis.
„ xanthopleura.
„ tuisensis.

Group CRYPTORRHYNCHINA.

Conotrachelus ruptus.
„ costaricensis.
„ extrusus.
„ rubricosus.
„ octocostatus.

Group ZYGOPINA.

Piazurus ecaudatus.
Hoplocopturus cavernosus.
Copturus crassus.

Group BARINA.

Diorymerus aratus.
Cœlorrhamphus (n. gen.) madopteroides.

The other additions to the Costa Rican list are the following ‡ :—

HYLOBIINA.

Hilipus guttatus.
„ angulosus.
„ sulcifer §.
„ penicillatus.
Hilipinus laticollis.
„ punctatoscabratus.
„ integellus.
Oncorrhinus scabricollis.
„ latipennis.
Lixus nigrinus.
Sternechus tuberculatus.
Ceratopus bisignatus.
Pyræchmes brevitarsis.

CHOLINA.

Cholus curialis : Infernillo and Tuis.
„ subcaudatus : Tuis

CRYPTORRHYNCHINA.

Cleogonus rubetra §.
„ armatus.
Chalcodermus angularis.
„ calidus.
„ dentipes.
„ radiatus §.
„ longirostris.
„ crassipes.
Rhyssomatus sculpticollis.
„ subcostatus.
„ nigerrimus.
Conotrachelus serratidens : Orosi.
„ rectirostris : Orosi.
„ subulatus.
„ quadripustulatus : S. José.
„ signatus.
„ impressicollis.
„ brevirostris.
„ unidentatus.
„ multiguttatus : Orosi.
„ duplicatus.
„ mixtus §.
„ cærulescens.

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* Panama. † Costa Rica (Mus. Brit.).
‡ The precise locality for these species is Turrialba, unless otherwise stated.
§ Mus. Brit.

Conotrachelus spinifer.
„ vittaticollis.
brevisetis.
squamifrons.
parvicollis.
crucifer §.
sinuatocostatus.
anaglypticus.
lateralis.
dentimanus.
„ verticalis.
Tylodinus planicollis Tuis, Orosi.
Euscepes divisus: Reventazon.
Phymatophosus squamanus.
Zascelis affaber.
Staseas granulatus
Eubulus punctifrons.
„ stipator
„ triangularis.
Metriophilus fugax.
„ rugifrons.
„ horridulus
„ minimus.
„ definitus.
Pisæus varicus.
Tyrannion imbellis.
Apteromechus pigmentatus.
Cryptorrhynchus quadrisignatus.

ZYGOPINA.

Cratosomus punctulatus.
„ gemmatus.

BARINA.

Peridinetus nodicollis.
Cyrionyx nebulosus.
Diorymerus lævipes. Tuis and Infernillo.
Diastethus ater: Tuis.
„ aztecus.
„ bidentatus: Tuis.
Rhianinus niveiscutum. Tuis.
Elliptobaris setulosus Tuis
Geræus tenuispinis.
„ albolineatus.
„ scutatus.
„ rubritarsis.
Dolichobaris opaciceps.
Pseudobaris cribripennis

COSSONINA

Cossonus convexirostris: Rio Colorado
„ spathula.

RHYNCHOPHORINA.

Metamasius sellatus.
Rhodobænus olivaceus.
„ maculifer.

1. *Exophthalmus nicaraguensis*, Bovie.

Additional examples of this fine species, from Tuis and Infernillo, Costa Rica, and Chiriqui and Lino, Panama, are now available for examination, including two more of the variety with a smoother disc to the prothorax noticed in the 'Biologia' in 1911 (Coleopt. iv. 3, p. 252). This form, when quite fresh, has the sides of the body, the humeri, apex, and legs clothed with small green scales, the ventral surface closely albo-squamose, and the ochraceous or whitish patches on the elytra larger, the oblique one at the apex oval in shape. Both forms occur at Tuis and Lino. The ♂ of each of them appears to be much rarer than the female.

12 (A). *Exophthalmus cuprirostris*, sp. n.

Oblong, narrow (♂), broader (♀), shining, piceous;

§ Mus. Brit.

rather sparsely clothed above and beneath with metallic green and cupreous scales, the latter mostly confined to the head, rostrum, and basal margin and apex of elytra, the green scales on the latter tending to form spots owing to the inequalities of the surface, the legs densely cupreosquamose. Head and rostrum closely punctured, the latter short, broad, with a smooth, stout, somewhat arched, posteriorly-undivided median carina. Prothorax broader than long, narrowed anteriorly, broadly flattened or hollowed down the middle, impressed with intermixed fine and extremely coarse, scattered, irregular punctures. Elytra subparallel in their anterior half in ♂, widened posteriorly in ♀, mucronate at tip, with closely-packed rows of very coarse punctures which are here and there transversely confluent, the interstices narrow and uneven. Tibiæ unguiculate at inner apical angle. Metasternum excavate in the middle behind in ♂.

Length (excl. head) 7½–8½ mm.

Hab. Costa Rica, Turrialba.

Three specimens. A close ally of *E. carneipes*, Champ. (figured in B. C.-Am., Coleopt. iv. 3, pl. xi. fig. 16), of which a long series from the same Costa Rican locality has been sent me for determination. The undivided rostral carina, the coarser puncturing of the prothorax and elytra, the sparser vestiture, and the brilliant cupreous scales readily distinguish the present species.

1 (a). *Chauliopleurus viridisquamans*, sp. n.

Very near and possibly a local form of *C. adipatus*, Champ. (1911), clothed above and beneath with rather large, rounded, brilliant metallic-green scales, the scales on the upper surface clustered along the sides of the head and prothorax, and also down the middle of the latter, and those on the elytra forming numerous sharply-defined spots, the scales on the head a little smaller than the rest; the elytra with rows of scattered coarse punctures, more or less interrupted by the irregular depressed areas in which the vestiture is placed.

Length (excl. head) 9½–11 mm. (♂ ♀.)

Hab. Costa Rica, Orosi.

Five specimens. Rubbed examples are separable from *C. adipatus* (figured in B. C.-Am., Coleopt. iv. 3, pl. xii. fig. 17), of which a long series from various Costa Rican localities is before me, by the uneven, irregularly seriatopunctate elytra.

5. *Decasticha tricostata*, sp. n.

♀. Elongate, narrow, subfusiform, black, densely albo-squamose at the apex and beneath, more sparsely so on the rest of the upper surface, the scales condensed into an elongate patch on the disc of each elytron near the tip, the close puncturing in part hidden by the vestiture. Head foveate between the eyes; rostrum short, stout, canaliculate, arcuato-emarginate at apex; antennal scape reaching the posterior margin of the eyes. Prothorax broader than long, parallel-sided at the base, narrowed anteriorly, broadly depressed down the middle posteriorly. Elytra long, subparallel to near the middle and then rapidly narrowed to the tip, the apical portion subconically produced and feebly dentate, the humeri obliquely truncate in front; with ten complete rows of punctures, those on the disc extremely coarse but appearing very small where partly covered by scales, the interstices densely, roughly punctured, 3, 5, and 7 more or less raised or costate to near the apex. Anterior tibiæ unguiculate at inner apical angle.

Length (excl. head) 8½ mm.

Hab. PAMAMA, Chiriqui.

One specimen. Differs from the four described species of the genus, all of which inhabit Costa Rica, by the raised convex alternate interstices of the elytra, and the single elongate white subapical streak between the second and third ridges on each elytron. This maculation may be partly due to abrasion of the scales, but similar marks are to be found in *D. tetrastigma* (figured in B. C.-Am., Coleopt. iv. 3, pl. xii. fig. 23). From *Compsus nigropunctatus*, Champ., and its allies *, the present species differs in the structure of the head, &c.

2 (A). *Pseudocyphus squaminasus*, sp. n.

♀. Oblong, piceous, densely clothed with pale brownish scales, those on the legs greenish, the elytra with a spot on the suture below the base and three others longitudinally arranged on the disc darker brown, the interstices each with a row of long semi-erect setæ, the head and prothorax feebly setulose, the tibiæ pilose; the surface densely punctulate, the head with a very fine median groove, the elytra conspicuously punctato-striate, the striæ fine. Head short, somewhat conical, the rostrum short, as broad as long, the scrobes subparallel anteriorly, the nasal plate trapezoidal, squamose, the eyes large and depressed; antennal scape short, much thickened towards the apex, reaching the posterior margin of the eye. Prothorax short, narrow, subcylindrical, feebly constricted before the base and apex. Elytra moderately long, about twice the width of the prothorax, subparallel at the base, the interstices slightly convex, the humeri tumid and laterally prominent. Legs rather slender, the tibiæ unarmed.

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* *C. 18-signatus*, Champ. (*l. c.* p. 288, pl. xiii. fig. 16, 1911), from Venezuela = *C. simoni*, Faust (1892).

Length (incl. head) 6 mm.

Hab. COSTA RICA, Turrialba.

One specimen. Differs from the various Mexican and Guatemalan species referred to *Pseudocyphus* in the 'Biologia' in the transverse squamose nasal plate, the narrow head and prothorax, and the strongly setose elytra. It approaches the variable *P. nigroguttatus*, Champ.

25 (A). *Hilipus turrialbæ*, sp. n.

Narrower than *H. guttiger*, Champ. (figured in B. C.-Am., Coleopt. iv. 4, pl. ii. fig. 12), the ochraceo-squamose submarginal stripe (which is here and there edged with small white spots) broader on the prothorax, and less sinuous and more or less continuous on the elytra (slightly interrupted posteriorly in one specimen), and enclosing the subapical prominence as in *H. guttiger*; the rostrum stouter, much shorter, and more curved; the prothorax rugosely, confluently foveolate, carinate anteriorly in ♂; the elytra with the almost bare discoidal area very coarsely, transversely rugose in ♂, coarsely punctato-striate in ♀; the first ventral segment of ♂ broadly depressed down the middle and sometimes with a longitudinal plica anteriorly.

Length (excl. head) 8–9 mm. (♂ ♀.)

Hab. COSTA RICA, Turrialba.

Three ♂ ♂ and one ♀, differing, as above stated, from *H. guttiger*, which ranges from Vera Cruz to Chiriqui. *H. limbatus* and *H. rectirostris* (figured, *op. cit.* pl. i. figs. 18, 19) are also allied forms, the former having a more slender, longer rostrum, and the latter a strongly angulate submarginal stripe on the elytra. The ♀ of the Turrialba insect has the prothorax and elytra much less rugose than the ♂.

32 (A). *Hilipus picticollis*, sp. n.

Very like *H. nigrofasciatus*, Champ. (figured in B. C.-Am., Coleopt. iv. 4, pl. ii. fig. 19), but with the black fascia on the elytra represented by a faint triangular blotch on the disc, the fulvous vestiture reduced to scattered patches, the small white spots more numerous along the sides of the elytra (the one on the disc in front of the dark patch usually wanting) and the prothorax with two at the base (one near each hind angle) similar to the one on the scutellum; the prothorax and elytra more strongly granulate; the rostrum much shorter and stouter in both sexes, the antennæ inserted beyond (♂) or at about (♀) the middle; the eyes well separated; the sides of the metasternum more sparsely foveolate; the first ventral segment of ♂ with a shorter, narrower, sparsely-pubescent excavation, and the metasternum in this sex simply depressed in the middle posteriorly.

Length (excl. head) 11–12 mm. (♂ ♀.)

Hab. Costa Rica, Turrialba.

Seven specimens. The allied *H. nigrofasciatus* is not uncommon in Nicaragua and Panama, and the present insect is from an intermediate locality, but the differences are quite constant.

8. *Ischiomastus carinifer*, sp. n.

Loxomorpha albomarginata, Champ. B. C.-Am., Coleopt. iv. 4, p. 719 (1906) (part.).

Ischiomastus albomarginatus, Champ. *op. cit.* iv. 7, p. 181 (1910) (part.).

♂. Very like *I. albomarginatus* (both sexes of which are figured in vol. iv. 4, pl. iv., *op. cit.*), and similarly clothed with dirty-white scales, the continuous marginal stripe of the same width; the rostrum curved, stout, as long as in ♀ of *I. albomarginatus* (comp. fig. 27, *op. cit.*), roughly punctured and squamulose to the points of insertion of the antennæ near the tip, the scape not reaching the eyes; the prothorax long, conical, a little narrowed at the base; the elytra broadly depressed and flattened on the disc, the fifth interstice carinate in its median third; mentum with a small blunt tooth; anterior coxæ each armed with a stout, curved, spoon-shaped process which is fulvo-pilose on its front aspect; ventral segments 1 and 2 broadly hollowed down the middle, 1 with a smooth shallow median groove.

♂. *Var.* Smaller; the elytra more uneven and less depressed on the disc, the basal margin much less raised, the abbreviated carina on the fifth interstice less conspicuous.

Length (excl. head) 8½–12½ mm.

Hab. Costa Rica, Cachi (*Biolley*: type), Tuis and Turrialba (var.).

Three ♂♂, differing from *I. albomarginatus* as stated above; the latter has been taken at Rio Sucio and Irazu by Rogers, and at Azahar de Cartago by Underwood. The Colombian *I. kirschi*, Faust, has similar coxal processes in ♂, which are wanting in the Costa Rican *I. albomarginatus*, Champ., and *I. marginatus*, Faust.

4. *Ischiomastus extensus*, sp. n.

♂. Elongate, subfusiform, opaque, black, clothed with scattered yellowish-white scales, which are larger along the sides of the prothorax and elytra and condensed into a continuous marginal stripe. Head and rostrum coarsely, rugosely punctured, the latter smoother at the tip, shining, and much longer than the prothorax, the antennæ inserted near the apex, the scape not reaching the eyes. Prothorax much longer than broad, subconical, closely impressed with coarse, rounded, squamigerous punctures. Scutellum small, transverse, smooth, and shining. Elytra elongate, much wider than the prothorax, broadly flattened and somewhat depressed on the disc, vertical at the sides, and with a short, stout, curved, oblique, laterally-projecting ridge on the fifth interstice at about the middle, the apical portion conical; seriato-punctate, the interstices closely impressed with small, shallow, rounded, squamigerous punctures, subgranulate at the sides and apex. Beneath coarsely punctured; mentum armed with a rather long blunt tooth; prosternum depressed and fulvo-pilose in front of the anterior coxæ, which are each armed with a stout, curved, forwardly-projecting, hook-like tooth. Metasternum in its apical half and ventral segments 1 and 2 deeply excavate down the middle. Femora dentate near the tip.

Length (excl. head) 11 mm.

Hab. Panama, Lino.

One rather worn specimen. Separable from the Costa Rican *I. carinifer*, ♂, by the coarse umbilicate puncturing of the prothorax, the prothorax itself more elongate, the oblique lateral expansions of the elytra, the pilose prosternum, and the posteriorly-excavate metasternum, the deep groove on which is continued down the first two ventral segments.

5. *Ischiomastus underwoodi*, sp. n.

Broader than *I. albomarginatus*, Champ., the continuous white marginal stripe very sharply defined and extending forward to near the tip of the rostrum, the scales on the rest of the surface small and dark brown, except for a few intermixed white ones on the femora and tibiæ; head foveate between the eyes; rostrum very stout, feebly curved, short, not longer than the prothorax, widened towards the apex, closely, finely punctured, sparsely and coarsely so on the glabrous apical portion, subcarinate down the middle, the antennæ inserted near the tip, the scape about reaching the eyes; prothorax subconical, not longer than broad, parallel-sided at the base, the puncturing extremely fine and shallow, with a few larger punctures intermixed; elytra broad, rapidly narrowed from the median third, broadly flattened and depressed on the anterior half of the disc, the seriate punctures distant one from another; mentum without tooth; anterior coxæ unarmed, contiguous; tibiæ simply curved; ventral segments 1 and 2 with a narrow, shallow, median groove.

Length (excl. head) 11½ mm. (♂?)

Hab. Costa Rica, Pozo Azul (*Underwood*).

One specimen, apparently ♂ (to judge from the form of the rostrum), but with the general facies of a ♀ and wanting the broad deep ventral excavation usually present in the former sex. This insect was incorrectly included (with a ♂ of *I. carinifer*) under *I. albomarginatus* in a supplementary list of Costa Rican localities given in the 'Biologia' in 1910.

11 (a). *Cholus stellatus*, sp. n.

♀. Smaller and narrower than the Nicaraguan *C. viduatus*, Pasc. (figured in B. C.-Am., Coleopt. iv. 4, pl. xv. fig. 12); oblong-rhomboidal, black, the elytra with numerous irregularly-distributed, small white spots, which show no tendency to coalesce into narrow fasciæ; the head and base of rostrum finely punctured, the latter almost smooth thence to the widened tip, strongly curved, and not so stout as in *C. viduatus*; the prothorax sparsely, finely granulate; the elytra long, subtriangular, much wider than the prothorax, less dilated at the sides below the base than in *C. viduatus* (which has somewhat oval elytra), sparsely granulate and regularly striato-punctate, the humeri rounded; mesosternum protuberant.

Length (excl. head) 12½ mm.

Hab. Costa Rica, Orosi.

One specimen. The less developed prothorax and the relatively wider base of the elytra, the sides of which do not form an almost continuous outline with those of the prothorax anteriorly as in *C. viduatus*, sufficiently distinguish the present species, apart from the smoother upper surface and the different arrangement of the numerous small patches of white scales.

11 (B). *Cholus orosiensis*, sp. n.

Elongate-rhomboidal, robust, moderately shining; black, the depressed spaces on the upper and under surfaces clothed with small scattered patches of fulvous or ochreous scales. Head sparsely, coarsely punctate; rostrum long, moderately stout, curved, widened at the tip, in ♂ rugosely punctured and unicarinate to beyond the middle, in ♀ smoother and not carinate. Prothorax broader than long, narrowing from the base, slightly constricted anteriorly, strongly granulate. Elytra elongate-triangular, at the base much wider than the prothorax, the humeri arcuato-dilatate; strongly, irregularly seriato-granulate, the coarse seriate punctures on the disc partly hidden by the granular sculpture, those on the lateral portions sharply defined. Beneath sparsely granulate; mesosternum slightly tumid between the intermediate coxæ; ventral segment 1 broadly flattened in the middle. Legs moderately long, the posterior femora not reaching the tip of the elytra; anterior femora feebly, the others sharply dentate; tibiæ unguiculate at tip externally and mucronate at inner angle. Length (excl. head) 12–14, breadth at shoulders 6–6¾ mm. (♂ ♀.)

Hab. Costa Rica, Orosi; Panama, Lino.

Three ♂ ♂ and three ♀ ♀. A large, elongate-rhomboidal form, superficially resembling *Erethistes fasciculosus*, Champ. (figured in B. C.-Am., Coleopt. iv. 7, pl. viii. fig. 31), from Chiriqui, but with laterally-projecting humeri, &c. The mesosternum is somewhat prominent in the Lino ♂. *C. foveolatus*, Champ. (*op. cit.* iv. 4, pl. xvi. fig. 1), from Costa Rica, also has the elytra much narrower at the base, &c.

25 (B). *Cholus xanthopleura*, sp. n.

Narrower and relatively more elongate than *C. lecideosus*, Pasc.; black, the antennæ (the infuscate club excepted) and tarsi ferruginous, the granulation of the upper surface coarse and close, leaving only very small, widely-scattered, ochreous spots, that of the under surface less distinct, the sides of the body densely, uniformly ochraceo-squamose, the vestiture on the ventral segments 3–5 reduced to small triangular lateral patches. Rostrum much longer than the head and prothorax, comparatively slender, arcuate, in ♂ closely punctured and unicarinate to near the middle, in ♀ much smoother and carinate at the base only. Prothorax subconical, broader than long. Elytra elongate, rounded at the sides anteriorly and at the base, forming an almost continuous outline with the prothorax, rapidly narrowing from a little below the humeri, the coarse tuberculiform granules here and there transversely confluent, partly interrupting the punctured striæ. Mesosternum flattened between the coxæ. Ventral segment 1 deeply sulcate down middle in ♂. All the femora sharply dentate, the tibiæ mucronate and unguiculate.

Length (excl. head) 8½–10, breadth 4–4½ mm. (♂ ♀.)

Hab. Costa Rica, Tuis and Inferuillo.

Eight examples seen. Separable from *C. lecideosus*, Pasc., by the sharply-defined, broad band of ochraceous scales along the sides of the body beneath, a character also to be found in the allied *C. tessellatus*, Champ. (25 a), and the less dilated basal portion of the elytra.

25 (c). *Cholus tuisensis*, sp. n.

♂. Smaller and narrower than *C. tessellatus*, Champ. (figured in B. C.-Am., Coleopt. iv. 7, pl viii. fig. 30); the granulation of the upper surface finer and not so close, that of the under surface much more conspicuous, interrupting the dense uniform squamosity of the flanks of the prothorax and the sides of the metasternum (as exhibited in *C. tessellatus*). Oblong-rhomboidal, rufo-piceous, the legs and antennæ ferruginous, the interspaces between the conspicuous shining granules on the upper and under surfaces ochraceo-squamose. Rostrum strongly curved, comparatively slender, about as long as the head and prothorax, closely punctured and uni-carinate to beyond the middle, much smoother at tip. Elytra rapidly narrowing from the base, finely punctate-striate, the granules here and there transversely confluent and uniseriately arranged on each interstice. Mesosternum flattened between the coxæ. All the femora sharply dentate.

Length (excl. head) 8–8½, breadth 3½ mm.

Hab. Costa Rica, Tuis.

Three specimens, differing as stated above from *C. tessellatus*, Champ., which was described in 1910 from three examples (♂ ♀) captured in Chiriqui. The allied *C. chrysalis*, Heller, from Costa Rica (figured, *op. cit.* iv. 4, pl. xxxv. fig. 28), is much narrower and finely granulate, and *C. lecidiosus*, Pasc., from Nicaragua and Costa Rica (*op. cit.* pl. xvi. fig. 4), is a broader and more coarsely granulate insect.

16 (A). *Conotrachelus ruptus*, sp. n.

Larger than the Guatemalan *C. lævirostris*, Champ. (figured in B. C.-Am., Coleopt. iv. 4, pl. xviii. fig. 14), the vestiture of the upper surface in great part fulvous, the rostrum extremely elongate, especially in ♀, the elytral costæ strongly sinuate, the median elevation on the third interstice greatly developed and abruptly angulate behind, the lateral margins not constricted behind the humeri. Oblong-subrhomboidal, piceous, the rostrum, antennæ, and tarsi obscurely rufescent; clothed with narrow fulvous scales, with some whitish scales intermixed near the hind angles of the prothorax and along the raised elytral interstices, the fulvous scales clustered into an oblique submarginal vitta on each side of the prothorax, and a stripe down each of the flattened interstices. Head rugosely punctured; rostrum curved, slender, very elongate, in ♀ as long as or longer than elytra, in ♂ punctured and feebly 5-carinate to beyond the middle, in ♀ much smoother, the antennæ inserted at the apical third in ♂ and at about midway in ♀. Prothorax nearly as long as broad, subconical, constricted anteriorly; coarsely, rugosely punctate and sharply carinate. Elytra triangular, at base very much wider than prothorax, bisinuate in front; coarsely punctato-striate, the striæ sinuate, the alternate insterstices 3, 5, 7 sinuato-costate, the costa on 3 abruptly twice interrupted, and with the median portion swollen and triangular as seen in profile, the humeri angulate. Mesosternum simply flattened between the intermediate coxæ. Femora unidentate.

Length 6½–7½, breadth 3¾–4 mm. (♂ ♀.)

Hab. Costa Rica, Turrialba.

Two ♂ ♂ and two ♀ ♀ seen. Separable from *C. octocostatus* (infra) by the sinuous or interrupted costæ, the prominent angulate hump on the third insterstice, and the non-excavate mesosternum. The Nicaraguan *C. fulvomaculatus* has a much stouter, straighter rostrum, less prominent humeri, a stouter, feebly interrupted costa on the third interstice, &c.

57 (A). *Conotrachelus costaricensis*, sp. n.

♂. Broad, short, robust, nigro-piceous; variegated with scattered fulvous and whitish hair-like scales, the whitish scales clustered into an oblique line on each side of the disc of the prothorax, a small transverse patch in front of the humeri, and a spot on each femur, and also conspicuously setose, the setæ on the elytra yellowish, coarse, and seriately arranged down each interstice. Rostrum arcuate, very stout, slightly longer than the head and prothorax, punctured and 7-carinate to near the tip, the short apical portion closely punctate. Prothorax transversely subquadrate, abruptly narrowed anteriorly; densely, rugosely punctured, carinate down anterior half, and with the narrow interspaces here and there raised or granulate. Elytra very broad, short, subtriangular; coarsely punctato-striate, the interstices rugulose, the alternate ones costate, 3 and 5 twice, and 7 once, interrupted, the median portion of 3 forming a short, stout, prominent ridge. Mesosternum flattened, broad, and sublamellate anteriorly. Legs rather short, stout, setose; femora each with a stout, acute, triangular tooth and a small tooth exterior to it.

Length 4½, breadth 2¾ mm.

Hab. Costa Rica, Turrialba.

One specimen. A short, broad, robust, setose form, with a stout, multi-carinate rostrum, a short prominent ridge on the third elytral interstices, bidentate femora, and a flattened, sublamellate mesosternum. *C. costaricensis* is not very closely related to any other species of the genus recorded in the 'Biologia'; it can be placed near *C. bispinis*, Champ. (No. 57), from Panama, figured on pl. xix. fig. 6.

109 (a). *Conotrachelus extrusus*, sp. n.

♂. Broad, moderately elongate; nigro-piceous, the antennæ and tips of the tarsi ferruginous; variegated with a sparse clothing of ochreous and white hair-like scales, the white scales clustered into a curved interrupted line on each side of the disc of the prothorax, a small patch within the humeri, several small scattered spots on the disc of the elytra, a common, narrow, cruciform fascia at the apex, and one or two spots on each femur. Rostrum moderately stout, feebly curved, a little longer than the head and prothorax, punctured and 7-carinate to near the tip, the short apical portion slightly widened posteriorly and closely punctate. Prothorax transverse, parallel-sided at base, much narrowed anteriorly; coarsely, confluently punctured, and strongly carinate. Elytra much wider than the prothorax, subtriangular; rugulose, coarsely punctato-striate, the alternate interstices sharply costate, 3 depressed below the base, abruptly interrupted beyond the middle, and with its median portion prominent posteriorly, 9 produced into a triangular tooth at its point of termination, the humeri obliquely truncate and slightly projecting externally. Mesosternum flattened, protuberant and binodose anteriorly. Femora each with a stout, acute, triangular tooth.

Length 5¾, breadth 3 mm.

Hab. Costa Rica, Turrialba.

One specimen. In this insect the prothorax is rugose and strongly carinate; the elytra have the ninth interstice produced posteriorly into a projecting triangular tooth or lamella, the third interstice abruptly interrupted beyond the middle, and the humeri angulate; the mesosternum binodose and protuberant; the femora sharply unidentate; the rostrum rather short, stout, and multi-carinate. An isolated form.

146 (a). *Conotrachelus rubricosus*, sp. n.

♀. Oblong-subrhomboidal, rufo-piceous, sparsely clothed with rust-red hair-like scales, with whitish ones intermixed on the elytra, legs, and under surface, the reddish scales clustered into an oblique line on each side of the disc of the prothorax and a transverse patch in front of the humeri. Rostrum strongly curved, not very stout, long, reaching to beyond the intermediate coxæ, almost smooth, punctured and subcarinate at base only, the antennæ inserted at the middle. Prothorax transverse, parallel-sided at base, much narrowed anteriorly; coarsely, confluently punctured, not carinate. Elytra at base much wider than the prothorax, subtriangular, rugose and feebly granulate, punctato-striate, the alternate interstices costate, 8 twice interrupted, 5 also depressed below the base. Mesosternum conically protuberant in front. Anterior femora bi-, the others uni-dentate. Tarsal claws with a short tooth.

Length 6, breadth 3½ mm.

Hab. Costa Rica, Turrialba.

One specimen. In the key given in the 'Biologia' (pp. 340–343), this species falls into Section B, near *C. quadrilineatus*, Champ., from Panama, to which, however, it is not very nearly related.

167 (a). *Conotrachelus octocostatus*, sp. n.

Larger and more robust than *C. serpentinus*, Boh. (= *ventralis*, Lec.) (figured in B. C.-Am., Coleopt. iv. 4, pl. xxi. fig. 19), the rostrum much stouter, the prothorax very coarsely punctured, the elytra with the alternate interstices more sharply costate. Nigro- or rufo-piceous, somewhat thickly clothed with rust-red, coarse, hair-like scales, with small patches of intermixed paler or whitish scales along the raised elytral interstices. Head coarsely, rugosely punctured; rostrum very long, subcylindrical, moderately stout, feebly curved towards apex in ♂, almost straight in ♀, punctured and multi-carinate to far beyond the middle, much smoother at the tip, the antennæ inserted beyond the apical third in ♂, and nearer the base in ♀. Prothorax broader than long, subconical, constricted towards the apex, very coarsely, confluently punctured, with an indication of a short smooth median line at about the middle. Elytra long, triangular, much wider than the prothorax, strongly bisinuate at base; coarsely punctate-striate, the interstices rugulose, 3, 5, 7, and 9 sharply, narrowly, uninterruptedly costate, the costæ on 3 and 5 abbreviated anteriorly, the humeri strongly rounded. Meso- and metasternum hollowed between the intermediate coxæ. Femora unidentate. Tarsal claws with a long tooth.

Length 8–9½, breadth 4½–5 mm. (♂ ♀.)

Hab. Costa Rica, Turrialba.

Six examples seen. This insect is about the same size as the Nicaraguan *C. fulvomaculatus*, Champ., differing from it in the shorter rostrum, subconical prothorax, narrowly costate elytra, hollowed mesosternum, &c.

8 (a). *Piazurus ecaudatus*, sp. n.

♂. Very like *P. caprimulgus*, Oliv., var. *a*, Champ. (figured in B. C.-Am., Coleopt. iv. 5, pl. i. fig. 19), the elytra narrowly subtruncate at apex, the dentiform sublateral prominences wanting, the velvety-black, arcuate, subapical fascia represented by a common broad subquadrate patch (in one example extending outward to the lower margin, but showing no tendency to continue upwards along the sides or suture); the prothorax with several minute whitish spots on the disc and the elytra with a few larger white spots along the anterior and posterior edges of the black patch; the tubercle at the base of the third elytral interstice moderately large; the first ventral segment with a broad deep median sulcus, which is shining and very sparsely punctured within (instead of densely punctured and thickly clothed with hair-like scales as in *P. caprimulgus*).

Length (excl. head) 7½–9, breadth 4¼–5¼ mm.

Hab. Costa Rica, Turrialba.

Three ♂♂. A form of the variable *P. caprimulgus* requiring a distinctive name. The vars. *α* and *γ* (*op. cit.* p. 12) were found at the same locality, but there is nothing intermediate amongst the long series of this common Tropical American insect before me.

6 (a). *Hoplocopturus cavernosus*, sp. n.

Elongate, broad, subelliptic; shining, black, the antennæ ferruginous; the head with a line of white scales between the eyes (which is continued forward along the sides of the rostrum) and a narrow band of red scales exterior to them; the prothorax with fiery-red scales on the anterior third, two transverse lines of white scales (one post-median and the other basal) on the outer part of the disc, and a patch of white scales at the anterior angles beneath; the elytra closely set with small brownish scales, which become whitish along the suture, and are condensed into a common darker brown spot below the scutellum; the sides of the body beneath with triangular patches of white scales. Rostrum not reaching the middle of the metasternum. Joint 2 of funiculus extremely elongate, as long as 3–7 united. Prothorax transverse, narrowing from the base, densely, rather finely punctate, and subcarinate. Elytra broad, subcordate, flattened, excavate along the suture anteriorly, transversely depressed at and below the base, and subnodose near the tip, the humeri swollen; deeply striate, the striæ with oblong, moderately coarse punctures, the interstices more or less convex and closely punctulate. Mesosternum vertical, unimpressed, the broadly excavate, mesially-sulcate, declivous anterior portion of the metasternum extending forward between the coxæ and limited in front by the arcuate cariniform margin of the mesosternum. Legs very long, slender; femora unidentate beneath, the intermediate and posterior knees armed with a sharp spine.

Length (excl. head) 6, breadth 3½ mm. (♀?)

Hab. Costa Rica, Tuis.

One example, slightly worn. This insect seems best placed under the genus *Hoplocopturus*, Heller. The rostrum is much shorter than in *Mnemynurus*, and the broad, anteriorly-produced, declivous portion of the metasternum is more broadly excavate than in *Copturus* (*Eucopturus*) *montezuma*, Champ., and its allies, the legs, too, being more elongate than in these latter.

13 (A). *Copturus crassus*, sp. n.

Elliptic, robust, opaque, piceous, variegated with narrow flavo-cinereous and dark brown scales, the pallid scales transversely arranged on the anterior half of the prothorax, and condensed into short streaks and spots on the elytra. Rostrum reaching as far as the posterior margin of the middle coxæ, widened, closely punctured, and sharply carinate at base, very sparsely punctulate and polished thence to the tip. Head narrowly grooved down the middle between the eyes, which are well separated. Joint 2 of funiculus elongate. Prothorax transverse, trapezoidal, densely punctured. Elytra short, broad, subcordate, blunt at tip; finely punctato-striate, the interstices flat, densely punctured. Intercoxal portions of meso- and metasternum moderately depressed, arcuate in front and behind, the suture between them straight. Legs stout, short; femora bidentate, the outer tooth small, the lower apical angle of each of them produced into a short tooth; intermediate and posterior tibiæ carinate externally.

Length (excl. head) 3¾–4, breadth 2¼–2½ mm.

Hab. COSTA RICA, Turrialba.

Three examples, probably including the two sexes. Broader and larger than *Copturomimus stridulans*, Champ., from Chiriqui, the anterior femora without bare strigose area, the eyes less approximate, the elytra more finely punctato-striate, the femora bidentate, &c. *C. crassus* can be placed near *Copturus maculosus*, Champ., also from Panama, and figured in the 'Biologia' (iv. 5, pl. v. fig. 13).

9 (A). *Diorymerus aratus*, sp. n.

Broad, rhomboidal, very shining, black, glabrous above; the rostrum and head, and the narrow anterior portion of prothorax, somewhat closely, and the rest of the latter very sparsely, minutely, punctured, the elytra deeply and rather broadly sulcate throughout, the sulci feebly crenate, the sides of the body beneath with scattered coarse punctures. Rostrum strongly arched, short, stout, convex above, narrower and flattened at the tip. Prothorax broader than long, rapidly narrowing from the base, constricted near the apex, the short tubulate apical portion narrow, the median basal lobe foveate. Scutellum narrow, oblong-quadrate, sulcate. Elytra triangular, somewhat gibbous, depressed along the suture at base, the humeri rounded, the interstices flat and almost smooth. Metasternum broad and flat between the middle coxæ, truncate in front. Femora sulcate beneath, unarmed, coarsely punctured. Tibiæ angular externally near the base, undilated at tip, the middle and posterior pairs straight, the anterior pair hollowed externally. Tarsal claws connate at base. Mandibles small.

Length 4¾, breadth 3¼ mm. (♂ ?)

Hab. Costa Rica, Turrialba.

One specimen. Narrower than *D. latus*, Champ. (figured in B. C.-Am., Coleopt. iv. 5, pl. xii. fig. 18), type from Durango, the elytra very sharply and rather broadly sulcate throughout, the scutellum narrow, sulcate, the rostrum short, very stout, and strongly arcuate. The inferiorly-sulcate femora, &c., separate *D. aratus* from *Diastethus ater*, Boh., and its allies. Casey, in 1922, added four Central American species to the old genus *Dorymerus*, and divided it into ten, to include numerous Brazilian forms.

Cœlorrhamphus, gen. nov.

(To follow the genus *Macrobaris*, Champ. B. C.-Am., Coleopt. iv. 5, p. 417.)

Mandibles small, decussate; rostrum short, arcuate, cylindrical, stout; antennæ short, with a small oval club; eyes extremely large, separated above by the width of the rostrum; prothorax elongate; scutellum small, transverse as seen from above; elytra elongate, striate, covering the pygidium, catenulate-striate; prosternum very deeply sulcate throughout, emarginate in the middle at the base, the walls of the cavity prominent; mesosternum declivous and transversely hollowed between the coxæ; anterior and intermediate coxæ distant, the former exserted, large; legs stout, the anterior pair elongated; femora unarmed, hollowed towards the apex beneath, not sulcate; tibiæ sinuous, unguiculate, the anterior pair in ♂ sharply triangularly lamellate below the apical uncus; tarsal claws minute, connate at base; body elongate, convex, cylindrical, glabrous above.

Type, *C. madopteroides*.

The above characters are taken from a remarkable Costa Rican Barid, with the prosternum as deeply sulcate as in a typical Cryptorrhynchid, the short rostrum fitting so closely into the cavity that it cannot be raised till the insect is in a relaxed condition; the anterior tibiæ of the ♂ dilated into an acute triangular plate at the tip beneath. The only allied Central American genera known to me are *Leptinobaris* and *Macrobaris*, Champ. (B. C.-Am., Coleopt. iv. 5, pp. 416, 417, 1909), both of which have an exposed pygidium, more approximate anterior coxæ, a less elongate prothorax, &c. Following Casey's arrangement of the Brazilian Barinæ (1922), the present genus should find its place amongst the "Cœlonertini" or "Coleomerini." The type has the general facies of a *Madopterus*, Schönh., which wants the rostral canal, &c.

1. *Cœlorrhamphus madopteroides*, sp. n.

♂. Shining, black, the antennæ and the dilated apical portion of the anterior tibiæ ferruginous, the metathoracic episterna clothed with white scales, the rest of the under surface and legs also with scattered minute white scales. Head and base of rostrum sparsely punctured, the antennæ inserted at about the middle of the latter, the rostrum itself very little longer than the width of the head. Prothorax much longer than broad, convex, somewhat conical, gradually narrowing from near the base, and compressed at the sides near the apex; very sparsely, minutely punctate on the disc, coarsely so at the sides. Elytra barely twice the length of, and not wider than, the prothorax, subparallel to about the middle, strongly transversely depressed below the base, rounded at tip, the humeri angular in front; sharply, narrowly punctato-striate, the punctures becoming more conspicuous towards the sides. Legs and under surface (the smoother ventral segments 2–4 excepted) coarsely punctured; ventral segment 5 with a closely pilose cavity in the middle; anterior tibial lamella coalescent with the apical uncus, appearing sharply bidentate at tip.

Length 4½, breadth 1⅓ mm.

Hab. Costa Rica, Turrialba.

One example.

XLVII.—*A few new* Rhopalocera *from Dutch New Guinea.* By the Rev. G. Hulstaert, M.S.C.

This short paper forms a continuation to the longer one, published in Ann. Soc. Ent. Belg. lxiv. p. 73 (Dec. 1924). The reader will be kind enough to refer to the latter in order to obtain the useful information about the collection to which the forms described here belong and the localities quoted. When writing the former paper, I did not know that the "assistant resident" of Merauke, Mr. K. C. H. van Haastert, who undertook the expedition, had taken such an active part in making the collection. I, therefore, wish to thank him here for his valuable help in advancing our knowledge of the New Guinean Lepidoptera.

Tænaris artemis intermedians, subsp. n.

♂. *Above.*—Ground-colour greyish. Fore wing: anal dark not extending above vein 3; apical border ± triangular, reaching vein 6; some scarce scales at termen. Hind wing: submedian hair bright yellow; greyish border light, covering the apical ocellus entirely and the anal one for a great part; the former transparent, the latter imperfectly present above and small.—*Below.* Darker. Fore wing: white less extended. Hind wing: costal border reaching to vein 7; distal border narrower than above; the proximal half of the ocelli free; anal margin narrowly black.

♀. Similar to the ♂, but the border of hind wing narrower; the anal ocellus free and entirely present, the subbasal yellow more extended.—*Below.* White more developed, especially on hind wing, where only a narrow costal and distal black border is left; anal margin entirely white; the ocelli pale-coloured; base feebly yellow.

Differs from *artemis*, Voll., by the less developed anal black on fore wing; from *humboldti*, Fruhst., by the white (♀) or narrowly black (♂) anal margin.

1 ♂, 1 ♀, Toerai.

Tænaris hyperbolus concolor, subsp. n.

♀. *Above.*—Fore wing: without any white marking, uniformly brown. Hind wing as in the other races; the apical ocellus transparent, the anal one present also above, of the same size as below, lacking the dark outer circle.

Below.—Ground-colour as in *T. h. hyperbolus*, Kirsch; the brown margins of hind wing developed as in this race, but the ocelli formed as in *automolus*, Kirsch.

Expanse.—82 mm.

1 ♀, "Toerai."

Tænaris dioptrica rileyi, subsp. n.

♂. *Above.*—Fore wing silky grey with narrow white anal margin, resembling many specimens of *onesimides*, Fruhst. Hind wing: borders as in *dioptrica*, Voll., somewhat broader at the apex and tapering towards anal angle. Apical ocellus transparent; the anal one present above, but smaller than beneath, with rather large yellow circle.

Below.—Fore wing: anal margin white. Hind wing:

white centre small, the borders broad, the distal one scarcely narrower between the ocelli, much broader than in *timesias*, Kirsch, for instance; the ocelli as in this race.

1 ♂, "Digoel."

Tænaris rothschildi vanhaasterti, subsp. n.

♀. Near *merana*. Fore wing: cell somewhat more white, the white patch remains farther from termen. Hind wing: border broader, covering the whole apical ocellus and the proximal half of the anal one; the former transparent, the latter present above, though not perfectly, less than in *pelagia*, Fruhst.; the border broad at the anal angle and margin. Hind wing: below as in *ansuna*, Fruhst., but broader at the anal margin, and narrower at termen; the ocelli large, the anal one separated from the terminal border by some whitish scales.

1 ♀, "Digoel."

Tænaris catops digulica, subsp. n.

♂. *Above.*—Fore wing: as in *vaneeckei*, m., with the apical black-grey extending to vein 4, but in one specimen (no. 3) ending already below 6. Hind wing: basal hair bright yellow; terminal dark area greyer than in fore wing, beginning at the apical ocellus (touching the latter only distally), growing broader below it, then narrower again, tapering to the anal angle, where it ends; the inner limit diffuse. No. 2 has the marginal border rather narrower—5 mm. at vein 6, 3 mm. at vein 5, 2 mm. at vein 4, and ending before the angle; the ocelli are less transparent than in nos. 1 and 3.

Below.—Fore wing: basal half of cell black; apical black broad, leaving only a small white area beyond the cell, at termen reaching the middle between veins 2 and 3. Hind wing completely encircled by blackish, though the anal margin but very narrowly; base of cell black; the costal dark extending to the cell; the apical ocellus is entirely on black background; the anal one limited by the dark border only distally and encircled by a grey outer circle. No. 3 has the cell of fore wing broader blackish, but the apical border leaves a very much larger white postcellular space, and extends only to vein 4 at termen. On the hind wing the costal black does not extend beneath vein 7; the apical ocellus remains free proximally; the terminal border tapers regularly and ends below vein 4; both ocelli larger.

3 ♂, "Digoel."

Tænaris catops vanhaasterti, subsp. n.

♂. *Above.*—Rather well resembling *T. c. vaneeckei*, m., but the costal margin of hind wing is brown, and the anal margin conspicuously, though narrowly, black; subbasal and submedian hair bright yellow.

Below.—Quite different. Fore wing cell much broader black; apical black also more extended. Hind wing: base of cell, and of interval between veins 6 and 7 black; costal black border reaching vein 7, including the apical ocellus; terminal border regularly tapering and ending at vein 3; anal ocellus with grey outer circle; anal border rather broadly black, but ending at vein 1 *a*.

1 ♂, labelled "Digoel." As the territory designed "Digoel" by Rev. Fr. Vertenten is so extended, it is not impossible we have here a representative of a quite different race. We received also two different forms of *Tellervo zoilus* from the same localities.

Tænaris catops turaica, subsp. n.

♂. *Above.*—Fore wing cellular black narrow; costal black not extending beneath vein 6, but at termen passing vein 4. Hind wing: subbasal hair bright yellow; terminal border originating at apex, broadest at vein 5 (±5 mm.), then tapering to anal angle; anal margin narrowly and finely black.

No. 2 is somewhat white above vein 6 of fore wing, and the apical black does not reach vein 5.

Below.—Fore wing: only the lower angle of cell white; the black border reaches vein 6, but does not extend beneath it; terminal border narrow (±5 mm.), leaving a broad white field beyond the cell and reaching vein 3. Hind wing: a triangular basal black patch; costal border with a feeble brownish tint; distal black border including the exterior half of the apical ocellus, tapering regularly to anal angle, being 6·7 mm. at vein 5; anal ocellus entirely free; anal margin finely black; fringes blackish at anal angle; the whole wing-surface is of a yellowish tint.

No. 2 has the basal black of hind wing more extended; the terminal border is narrower, and remains farther from the anal ocellus; the wing-surface is whitish; the fringes of anal region white.

2 ♂, Toerai.

Elymnias agondas vertenteni, subsp. n.

♂. Fore wing: a very feeble greenish subapical band, which by some specimens is indicated only by some scales; much nearer apex than in *melane*, for instance; the region beyond it a little paler. Hind wing: anal band reaching ± vein 5, greenish blue, with a more or less developed orange-red tint; ocelli present or absent.

3 ♂ from Merauke in our collection; 3 ♂ and 1 ♀ in coll. E. J. Nieuwenhuis (Rotterdam); some ♂ from Tocrai and Digoel also in our collection.

Although this species seems to be rather variable, I am describing this new race on account of the constancy of the given characteristics.

Note.—It may seem premature to describe the above-mentioned races on such a small number of specimens. I should not have done it, certainly, if many other species did not demonstrate the racial character of the South New Guinean representatives. Possibly not all the forms will prove to be good subspecies when a large number of examples will be available, especially in such variable species as are *Tænaris*, but I trust some of them will stand, if not all, as races or at least as forms worthy of a name.

XLVIII.—*Descriptions de Coccinellides appartenant à la Collection de M. Andrewes, de Londres.* Par le Dr. Sicard.

M. Andrewes, de Londres, a bien voulu me confier, il y a déjà fort longtemps, l'examen d'un certain nombre de Coccinellides de l'Inde. Bien qu'un accident survenu à la boite qui les contenait en ait détruit une partie, j'y ai trouvé quelques formes nouvelles dont je donne ci-dessous les descriptions.

Solanophila erinacea, sp. n.

Subhemisphærica, rubro-testacea, maculis duabus rotundatis suturalibus, vittisque tribus transversalibus in elytro singulo, intus abbreviatis, instructa; pube cinerea semierecta dense vestita. Subtus pedibusque rufis, metasterno nigro-maculato.

Long. 0·004 mm.

Nilgiri Hills.

Arrondie, convexe, d'un rouge roux, tachée de noir sur les élytres et couverte d'une pubescence grise mi-dressée et assez dense, surtout sur les élytres, mais ne masquant pas la couleur foncière. Tête rousse, avec les palpes et les antennes un peu plus clairs. Corselet en arc de cercle large et non sinué à la base, à côtés rectilignes, médiocrement convergents en avant, échancré carrément en avant, avec les angles antérieurs arrondis; d'un roux rougeâtre plus clair sur les côtés, luisant, à ponctuation extrêmement fine et assez clairsemée. Ecusson petit, triangulaire, concolore. Elytres régulièrement arrondis, ayant avant le milieu leur plus grande largeur, à ponctuation double, plus grosse que celle du corselet, à pubescence mi-dressée et assez dense, grisâtre ; d'un rouge roux avec deux taches suturales et trois courtes bandes noires. La première tache située juste en arrière de l'écusson, irrégulièrement arrondie, couvrant environ le cinquième de la largeur des élytres et un peu moins du quart de la longueur de la suture ; la seconde tache suturale un peu plus grosse, en arrière du milieu, arrondie, couvrant à peu près le quart de la largeur et de la longueur des élytres ; la première bande en forme de tache ovalaire, couvrant le calus en laissant le bord externe de l'élytre étroitement de la couleur foncière, touchant le bord antérieur par sa partie convexe et atteignant presque en dedans la première tache suturale dont la sépare une tache triangulaire à base antérieure située de chaque côté de l'écusson. Deuxième bande un peu en avant du milieu des élytres, transversale, dirigée un peu en avant et en dedans jusqu'aux quatre cinquièmes de la largeur des élytres, sa partie interne arrivant au niveau de l'intervalle qui sépare les deux taches communes, à peu près d'égale largeur, celle-ci couvrant un huitième du bord externe ; la troisième bande en forme de tache transversalement ovalaire, à peu près de même longueur que la première, dirigée du niveau de la courbure postérieure des élytres vers la partie postérieure de la tache commune qu'elle n'atteint pas tout à fait.

Dessous roux avec une tache noire sur les côtés du métasternum ; plaques abdominales petites, atteignant les trois quarts du segment, leur bord externe remontant en dedans de l'angle antérieur du premier arceau ventral. Ongles courts, épais à la base, leur partie interne plus large et plus courte que l'externe.

La pubescence mi-dressée de cette espèce la rend facilement reconnaissable.

Epilachna grayi, var. *zebra*, nov.

D'un rouge fauve comme le type. Corselet présentant également une tache médiane noire. Taches des élytres réunies transversalement et formant trois bandes : la première étendue d'une épaule à l'autre, ondulée en arrière en forme d'accolade horizontale, enclosant à sa partie antérieure, de chaque côté de l'écusson, une tache semilunaire de la couleur du fond ; deuxième bande située vers le milieu de l'élytre, transversalement dirigée, rétrécie au milieu, ovalairement renflée à sa partie interne où elle s'unit largement par la partie postérieure de ce renflement à la partie antéro-externe d'une grosse tache suturale quadrangulaire ; troisième bande située au niveau de la courbure postérieure des élytres, oblique en dedans et en avant, unie en cet endroit à la partie postérieure de la tache suturale quadrangulaire.

Dessous roux avec le postpectus noir et la plus grande partie de l'abdomen d'un brun foncé.

Nilgiri Hills.

Stictobura rubroguttata, sp. n.

Hemisphærica, glabra, testacea. Elytris nigris, maculis duabus rubro-sanguineis ornatis. Pedibus testaceis.
Long. 0·006 mm. (vix).

Taille et forme des grandes espèces de *Stictobura* (*pallideguttata, semipolita, trichroa*), et comme elles fortement gibbeuse, mais bien distincte par le dessin des élytres.

D'un testacé flave en dessus et en dessous, avec les palpes, les antennes et les pieds de même couleur. Elytres noirs avec la partie interne des épipleures testacée et deux taches d'un rouge de sang sur chacun : la première tache transversale, semblant formée d'une tache ovalaire unie à un point plus externe, étendue à peu près sur la moitié médiane de l'élytre en largeur et du huitième au tiers de la longueur ; la deuxième tache, semilunaire, à partie convexe postéro-interne également éloignée de la tache 1 et de l'angle postérieur des élytres, deux fois plus rapprochée de la suture que du bord externe, couvrant à peu près la moitié de la largeur de l'élytre à son niveau. Elytres à gouttière étroitement relevée, continue jusqu'à l'apex.

Ponctuation élytrale double, les gros points disposés par endroits en courtes séries longitudinales visibles surtout au niveau des taches claires.

Nilgiri Hills.

XLIX.—*On a new Species of* Rossia *from South Africa.*

By Guy C. Robson, M.A.

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Among the Cephalopoda obtained by Dr. J. D. F. Gilchrist in South African waters in 1920–21 and forwarded by him to the British Museum (Natural History) for examination were two very large examples of *Rossia.* These specimens were not described in the report published on the collection (Robson, 1924 *b*), as the station-number and other data were not available, the specimens being referred merely to the "Cape area."

Further examination has revealed in the structure and relationship of these specimens certain interesting facts which it is desirable to place on record.

Rossia, sp. *α.*

"Cape area" (*J. D. F. Gilchrist*). Two adult ♀ ♀.

The species is designated by a symbol in accordance with the suggestions put forward in a previous paper (Robson, 1924 *a*, p. 1).

Dimensions.

	No. 1. mm.	No. 2. mm.
Mantle, length	65	65
" , width	44	45
Head, width	45	48
Fins	R. 47×27	R. 49×30
	L. 50×27	L. 46×30
Funnel organ	21×22	23×24
Arms, 1st pair	?	54
" 2nd "	56	51
" 3rd "	56	51
" 4th "	53	48
Tentacles, length	155 (L.)	?
	150 (R.)	?

In general appearance the animal is very like *Rossia mastigophora,* Chun. On the "general facies" test of specific identity the two forms would be regarded as conspecific. In a number of details, however, the form described here differs from the above species and resembles *R. enigmatica,* Robson (1924 *b*, p. 635). Externally it is differentiated from that form by its greater size and possibly by the narrower mantle. In specimen no. 2 the edge of the mantle is thickened to form a marked rim, as in *R. mastigophora*, a feature which is absent in no. 1.

The *fins* are different from those of *enigmatica*, being narrower and less rounded.

The dorsal surface of the mantle and head is densely covered with red and purple chromatophores, which become sparser on the fins. The ventral surface is paler, the chromatophores being less numerous on the fins and head. The dorsal surface of the arms is more vividly coloured than the ventral. The colouring of *enigmatica* is unknown, that of *mastigophora* is browner.

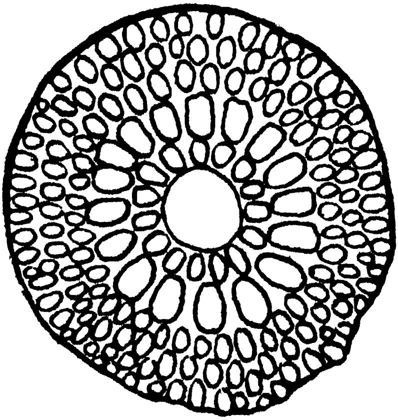
The *nuchal cartilage* resembles that of *enigmatica*. The *arms* have the proportion 1 . 2=3 . 4 in both specimens. In *enigmatica* we find 3 . 2 . 4 . 1 and 3 . 4 . 2 . 1. These proportions are so much affected by the state of preservation, etc., of the arms that they cannot be relied on for taxonomic purposes. In this case, however, the reversal of the proportions is likely to be significant: though we should point out that, in the Œgopsida, Pfeffer (1912, p 468) has shown that the proportions of the arms are subject to change with increase in size.

All the arms are provided with dorsal keels, of which those of the third and fourth arms are better developed, as in *enigmatica*.

As usual with these animals the suckers of the sessile arms fall off very easily, and they are thus absent over a very considerable area of all the arm in these specimens. A comparison with the suckers of the female of *enigmatica* is out of the question, as the suckers of the latter are almost entirely absent. In the present specimens the suckers are normal in size and scarcely differentiated, except that on the third (and possibly the second) arm the median ones are slightly larger than the rest. As in *mastigophora* and *enigmatica* the rings of these suckers are toothless. They are a little under one-half the total diameter of the whole sucker. In *enigmatica* they are smaller, viz. under one-third. The *tentacles* are a little longer in this species than in its relatives, though the value of such a character is dubious. The *club* is 41 mm. long, *i. e.* about one-quarter the total length of the tentacle; it is bordered by a lateral membrane, the distribution of which resembles that of *enigmatica*. The membrane itself, however, is not so wide as in the latter form.

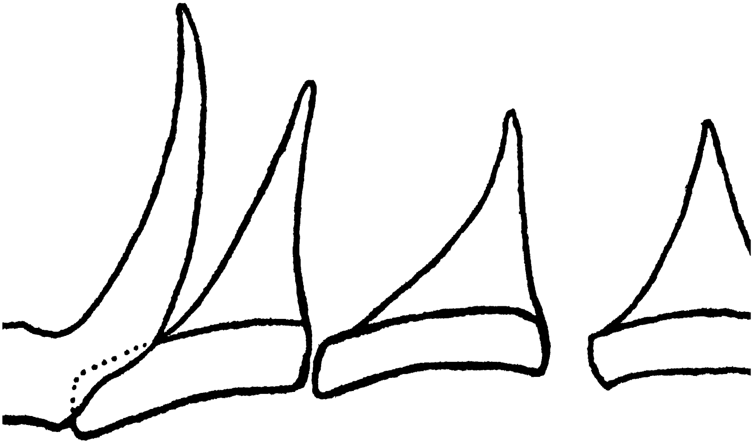
The tentacle-suckers (fig. 1) are toothless, but the surface is usually armed with five circlets of plates, though occasionally there is evidence of a sixth row. Both this species and *enigmatica* differ from *mastigophora* in having more rows of plates, while the plates themselves are not "polyhedral" (Chun, 1915, p. 407), but ellipsoid, those of *enigmatica* being the more rounded.

Fig. 1.



Rossia, sp. *a*. Tentacular sucker, × 220.

Fig. 2.



Rossia, sp. *a*. Radula, × 80 (camera).

The *funnel organ* differs somewhat from that of *enigmatica*. The two arms of the median plate are longer and more parallel-sided, while the lateral plates are wider. The *adhesive organ* resembles that of *enigmatica* very closely, both these forms having the sides of the head-plate expanded somewhat apically, instead of being markedly contracted as in *mastigophora*.

The *radula* (fig. 2).—In view of the general similarity between this form and *enigmatica,* it is remarkable to have to record a striking dissimilarity in the shape of the radular teeth. This dissimilarity is not due to differences in orientation, which, as I have already pointed out, can often vitiate comparisons of this sort.

The cusp of the median tooth is shorter, has a wider base, and is altogether more heavy than that of *enigmatica.* The basal plate is more curved. The admedian tooth is similarly shorter and the sides of the cusp slope away far more gradually than in *enigmatica.* We notice also that in the latter the inner edge of this tooth is almost perpendicular—less slanting, in fact, than in the original figure (Robson, 1924 *b*, fig. 21), while in this form it usually slants away from the median tooth. The second lateral is less elongated; while the third lateral is markedly different. The basal plate of this tooth is more quadrangular and oblong than that of *enigmatica*; while a highly characteristic feature is seen in a basal constriction of the shaft of the tooth, which is not found in any tooth of the allied form.

The status of this form is very difficult to determine. It is distinguished from *mastigophora* in (1) colour, (2) proportions of the arms, (3) size of tentacular club, (4) funnel organ, (5) adhesive organ, and (6) plates of tentacular suckers; while it differs from *enigmatica* in (1) size, (2) proportions of the fins, (3) proportions of the arms, (4) funnel organ (slight difference), and (5) radula. In general, it is very closely related to *R. enigmatica.* Of the five differences set forth above the first and fifth are critical. The second and third might be expressions of a difference in growth-stage and might therefore be correlated with (1). The fourth difference by itself I regard as unimportant.

With regard to the differences in size, *R. enigmatica* is represented by three examples with a mantle-length of 25 mm. The two examples of the new form are each 65 mm. long, being in fact larger than any example of *Rossia* known to me, and it is therefore a question whether *enigmatica* is merely a young stage of this large form. As shown already (Robson, *l. c.* p. 639), the spermatophores are completely formed in *enigmatica*, so that one might infer that the latter is adult. I have, however, shown (*l. c.* p. 612) that the spermatophores are fully formed in *Histioteuthis* before the animal attains its full size. Assuming that an argument from *Histioteuthis* to *Rossia* is legitimate we cannot take the complete spermatophores as a proof of adult condition, so that *enigmatica* may not be fully grown. On the other hand, the differences in the radulæ are so striking that, if regarded by themselves, they would at once be regarded as evidence for specific distinction. Furthermore, although I have stated above that we have evidence that the proportions of the arms change with age, this evidence refers to the large squids referable to *Stenoteuthis.* In the larger specimen of *Rossia mastigophora*, which is in size halfway between the new form and *enigmatica*, the proportions of the arms are the same as in the latter !

It is therefore apparent from these considerations that the precise status of these interesting forms must be regarded as uncertain until we are possessed of more knowledge of the growth of the taxonomically significant organs in the Myopsida.

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ROBSON, G. C. 1924 *a*. 'Union of South Africa; Fisheries and Marine Biol Survey,' 3, no. ix.
——. 1924 *b*. Proc. Zool. Soc. p. 589.

L.—*A new Crab of the Genus* Sesarma *from New Guinea.* By W. T. CALMAN, D.Sc., F.R S.

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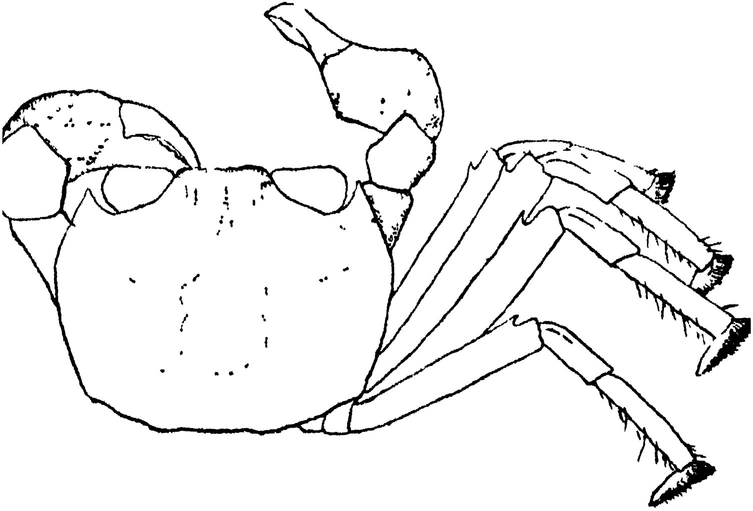
THE specimen described below was collected in New Guinea by Mr. P. J. de Verteuil and was presented to the Museum by the Imperial Bureau of Entomology. Unfortunately, there is no information as to the exact locality, habitat, or habits of the crab. The remarkable structure of the feet suggests that its mode of locomotion will be found to differ from that of other species of *Sesarma,* to which genus it is provisionally referred.

Sesarma crepidatum, sp. n.

Description of Male.—Carapace flat with a slight convexity anteriorly, greatest width at about the anterior third, length four-fifths of greatest width and equal to distance between exorbital teeth. Lateral margins strongly curved, without teeth, but with an obscure notch a little behind exorbital tooth. Dorsal surface without hair, polished, punctate, with the regions, especially the gastric and cardiac, well defined. Postfrontal lobes rather prominent, rounded and slightly rugose, the middle pair about twice as broad as the outer pair, from which they are separated by broad shallow grooves. Front vertically deflexed, width hardly exceeding one-third of distance between exorbital teeth, margin everted and very slightly sinuous as seen from above.

Chelipeds equal. Merus with subterminal notch but no spine above. Outer surface of carpus granular, inner angle rounded with a tuft of long hairs proximal to it. Palm with a prominent row of large granules on inner surface; outer surface convex and granulated proximally, excavated and smooth towards the base of the fingers; the junction of the convex with the excavated area forms a prominent ridge, about the middle of which a closer grouping of the granules suggests an obsolete tubercle like that found in *S. gracilipes*, H. M.-E. Upper surface of palm with a number of short, overlapping, longitudinal ridges, finely beaded. Dactylus curved, its upper surface granulated near the base, with a middle row of somewhat larger granules.

Fig. 1.

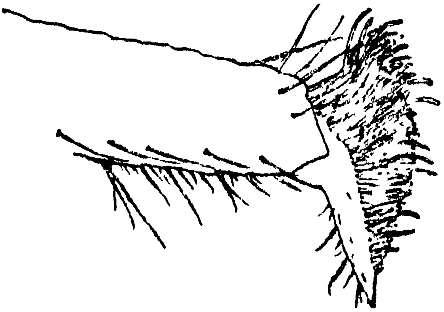


Sesarma crepidatum, sp. n., ♂, holotype. × 3.

Legs slender, the third pair more than twice as long as the carapace. Merus not expanded, in third pair about four times as long as broad. Propodus with a few scattered long hairs. The dactylus (which, in the third pair, is less than half as long as the propodus) appears to be permanently more or less flexed, and has on its outer or extensor face a dense brush of strong bristles spread out so as to form a broad flat "sole" extending the whole length of the dactylus. The bristles, though stout, are flexible, and are densely feathered along one side and blunt at the tip.

The abdomen fills the space between the last pair of legs. The telson is abruptly narrower than the last somite and a little broader at the base than it is long.

Fig. 2.



Sesarma crepidatum, tip of third leg, further enlarged.

Measurements.—

Length of carapace	12·25 mm.
Greatest breadth of carapace	15·5 „
Width of front between eyes	4·5 „
Length of third leg	27·0 „
Length of merus of third leg	11·25 „
Width „ „ „	2·75 „

Remarks.—The presence of an oblique ridge on the third maxillipeds, the reticulation of the pterygostomial regions, the widely open inner orbital gap, and the abruptly deflexed front would refer this species to the genus *Sesarma* (cf. Tesch, 'Siboga' Exp., Brachyura, i. p. 108, 1918, and Zool. Meded. Leiden, iii. p. 234, 1917), and, of the subgenera which are recognised in that genus, it probably approaches most closely to *Holometopus*. It differs, however, from most and probably from all the described species of *Sesarma* in the strongly curved lateral margins of the carapace and in the narrowness of the front. The remarkable furred moccasins on its feet are unlike anything known to me among the Brachyura, and have the appearance of being an adaptation to running over soft mud.

LI.—*Notes on African Non-marine Mollusca, with Descriptions of many new Species* (continued). By M. Connolly.

[Plate XXVIII.]

Family **Zonitidæ**.

Subfamilies uncertain.

Genus Thapsia, Albers, 1860.

Thapsia oscitans, sp. n. (Pl. XXVIII. fig. 1.)

Shell fairly large, depressed globose, narrowly umbilicate, thin, smooth, rather glossy, transparent, corneous yellow-brown. Spire not much raised, though each whorl projects above the next; apex obtuse. Whorls 5, regularly increasing, little convex above, slightly shouldered, but not keeled, at the periphery; the irregular growth-wrinkles are hardly visible except on the last whorl and just below the sutures of the last two, but the whole surface is sculptured practically to the apex with very fine, close, regular spiral striæ, which become slightly granulate and undulate on the last two whorls; the transverse striation is regular and stronger on the base, the spirals as described above; suture well defined, crenulate on the last 2 whorls. Aperture rather irregularly lunate, slightly oblique, descending at the base; peristome simple, acute, columella short, weak and concave, margin scarcely reflexed, hardly covering any of the minute umbilicus.

Diam. maj. 22·0, min. 18·0; alt. 13·0; apert. alt. 9·8, lat. 11 6 mm.

Hab. S. Nigeria, Oban (type, *P. A. Talbot*); Buea (*Bates*).

Type in British Museum.

The upper margin of the aperture descends more steeply than in *T. troglodites* (Morelet), while the columella is more erect and the base of the aperture descends a little more noticeably than in either that species or *T. calamechroa* (Jonas).

Thapsia germaini, sp. n. (Pl. XXVIII. fig. 2.)

Shell of fair size, depressed globose, very narrowly umbilicate, thin, smooth, shining, semitransparent, corneous yellow-brown. Spire moderately elevated, sides slightly convex, apex bluntly rounded. Whorls 6, fairly convex, regularly and rather gradually increasing, very bluntly angulate at the periphery, apex smoothly micropunctate, remaining whorls sculptured all over with a few extremely weak, distant, irregular growth-wrinkles and very close, exceedingly faint, microscopic spiral striæ, only just visible under 50-fold magnification; suture simple, well defined. Aperture ¾-lunate, a little more broad than high, peristome simple, acute, outer lip receding in profile in a sinuous curve to a point a little below the periphery, but no further; columella very weak, concave, margin very narrowly reflexed, half covering the minute umbilicus.

Diam. maj. 15·8, min. 14·6; alt. 9·6; apert. alt. 6·4, lat. 7·6 mm.

Hab. SAN THOMÉ (*L. Fea*; *H. J. Snell*).

Type in Muséum d'Histoire naturelle, Paris.

The general shape of the shell is flatter than that of *T. thomensis* (Dhrn.) and the aperture a little more broad in proportion to its height, while the spiral sculpture is more plainly visible, especially on the base, where, in *thomensis*, it is impossible to distinguish it under the same magnification. I have pleasure in dedicating the new species to Dr. L. Germain, who has kindly assisted me in its examination and agrees that it is hitherto undescribed.

Genus GUDEËLLA, Preston, 1911.

Gudeëlla tricolor, sp. n. (Pl. XXVIII. fig. 8.)

Shell of moderate size, depressed globose, narrowly umbilicate, thin, smooth, glossy, transparent, corneous, greyish white above, with a broad red-brown band above the periphery, yellowish white beneath. Spire not much raised, sides regular, apex obtuse. Whorls 5¼, regularly increasing, not very convex, almost imperceptibly shouldered at the periphery, engraved almost to the extreme apex with close, fine, regular, very slightly wavy, microscopic spiral lines, a little fainter on the base, which cut the weak, irregular, straight, transverse growth-lines and show, as a rule, brown on the whitish, and grey on the brown bands on the upper side of the shell; suture simple, well defined. Aperture sublunate, peristome simple, acute, outer lip straight and erect in profile, columella weak, concave, margin scarcely reflexed, not overhanging the very narrow, but deep, umbilicus.

Diam. maj. 8·2, min. 7·2; alt. 4·3; apert. alt. 3·0, lat. 4·0 mm.

Hab. CAMERUN, Bitze (*Bates*).

Although this may eventually prove to be one of the species mentioned by d'Ailly from North Camerun, or by Pilsbry from the Belgian Congo, it does not appear to agree with any of their descriptions, and the fact of its locality being a good deal further south supports the probability of its being distinct.

Genus TROCHOZONITES, Pfeffer, 1883.

Subgenus ZONITROCHUS, Pilsbry, 1919.

Trochozonites (*Zonitrochus*) *adoxus*, sp. n.
(Pl. XXVIII. fig. 4.)

Shell of fair size, conical, narrowly umbilicate, thin, nearly smooth, moderately glossy, transparent, pale corneous brown. Spire elevated, sides a little convex, meeting at about a right angle, apex acute. Whorls 5½, nearly flat, gradually increasing, sharply keeled at the periphery, protoconch smooth, with a few scratchy microscopic transverse lines, remainder weakly, irregularly, rather coarsely, distantly striate all over in the lines of growth; suture simple, shallow. Aperture subrhomboidal, peristome simple, acute, outer lip straight in profile, receding somewhat to the periphery and thence to the base, columella weak and concave, margin hardly reflexed, not obscuring the small umbilicus.

Diam. maj. 9·6, min. 8·5; alt. 6·6; apert. alt. 3·0, lat. 4·7 mm.

Hab. UGANDA, Malange, Abiri Forest, 4000 ft. (*R. A. Dummer*).

Type in South African Museum, Cape Town.

A much broader shell than *T.* (*Z.*) *prestoni*, Conn., and *buhambaensis* or *expatriata*, Preston, and smaller than *sharpei* or *leptaleus*, Smith. Its shape is more nearly that of *ibuensis*, Pfr., or *reticulatus*, d'Ailly, which, however, belong to the section *Trochozonites*, s. s.

Trochozonites (*Zonitrochus*) *prestoni*, nom. nov.

1914. *Trochozonites suturalis*, Preston, P. Z. S. p. 805.

Preston's species cannot retain its name, which was employed in the same genus by d'Ailly in 1896; I therefore rededicate it to its author.

I have examined under a microscope the embryonic whorls of nearly all the known species of *Trochozonites*, and append the subgeneric classification of these and of a few others in which the original description makes it clear as to which of Pilsbry's new subgenera they belong :—

(i) *Trochozonites*, s. s (with microscopic spiral sculpture on embryonic whorls).

bellulus, Mts.
bifilaris, Dhrn
calabaricus, Pfr.
folini, Morel.
ibuensis, Pfr.
leroyi, Bgt.
lindstromi, d'Ailly.
mamboiensis, Smith.
palmarum, Morel
percarinatus, Mts.
pilosus, d'Ailly.
plumaticostatus, Pilsb.
reticulatus, d'Ailly.
suturalis, d'Ailly.
talcosus, Gld.
theeli, d'Ailly.
trifilaris, D & G
tumidulus, Mts.

(ii) *Zonitrochus*, Pilsbry (with embryonic whorls almost smooth, devoid of spiral sculpture)

adorus, Conn.
aillyi, Pilsb.
buhambaensis, Prest.
expatriatus, Prest.
leptaleus, Smith.
medjensis, Pilsb.
prestoni, Conn.
sharpei, Smith.

(iii.) *Teleozonites*, Pilsbry (embryonic whorls ribbed to apex, without spiral sculpture).

adansoniæ, Morel.
percostulatus, D. & G.

Subfamily *VITRININÆ*.

It is with some reluctance that I venture to describe new species of this subfamily and of the Helicarioninæ without being able to present full details regarding their anatomy and exact generic position. The shells of the four new species, however, are quite distinct from those of any which I can find to have been already described; thanks to the kindness of Colonel Peile I can publish full information as to their radulæ, and the animals of at least two of them are in the hands of H. Watson, to whom I am indebted for his suggestions as to the most appropriate genera in which, provisionally, to place them.

I retain, for the present, the arrangement of the Helicarioninæ adopted by Watson in Proc. Malac. Soc. xiv. 1920, p. 135 etc., but have intentionally misplaced this subfamily after the Vitrininæ in order to facilitate the description of certain species.

Genus Vitrina, Draparnaud, 1801.

Vitrina ugandensis, Thiele, 1911.

Wiss Ergebn. D. Z.-A. Expn. iii. p. 189, pl. v. fig. 36.

Described by Thiele from shells sent by E. A. Smith to von Martens, without the exact locality being given, I may state that the original lot were collected by Doherty on the Mau Escarpment, which was then in Uganda, but is now part of Kenya Colony. I have also seen specimens from Nairobi (*Falloon*) and Naivasha (*Miss Pickford*).

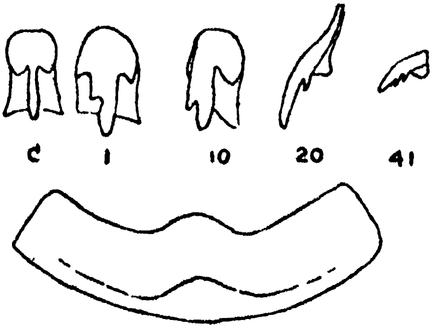
Vitrina lactea, sp. n. (Text-figs. 1 & 2.)

Shell small, elongate depressed globose, imperforate, very thin and glossy, transparent, corneous, pale yellowish brown.

Text-fig. 1.

Vitrina lactea, Conn., shell, somewhat enlarged.

Text-fig. 2.



Vitrina lactea, Conn., teeth from the radula, × about 400, and maxilla, × 40.

Spire but little raised, apex mammillate. Whorls $2\frac{1}{2}$, convex, very rapidly increasing, the protoconch showing a few transverse puckers under 50-fold magnification, remainder weakly, but closely and regularly, transversely striate, with faint, irregular, disconnected longitudinal scratches just below the suture, but not elsewhere, and probably of no specific importance; suture simple, well defined. Aperture elongate oval, upper and lower margins both equally descending, peristome simple, acute, outer lip straight in profile until nearing the periphery and then receding sharply, columella erect, margin not reflexed.

Diam. maj. 11·1, min. 8·2; alt. 6·5; apert. alt. 5·0, lat. 7·4 mm.

Hab. KENYA, Mt. Kenya (*Kemp*; *Gregory*).

A very plain little shell, differing from *V. ugandensis*, Thiele, in having a less prominent apex, and from *H. baringoensis*, Smith, in its protoconch being devoid of spiral sculpture.

Notwithstanding the close similarity between the radula of this species and that shown in text-fig. 5, which belongs to another genus, it appears that *lactea* must be some kind of *Vitrina*, since the animal is believed to be destitute of a caudal mucous pore. The radula measures 3·0 × 1·5 mm. when flattened out; its formula is 42 . 1 . 42 × (71 + nascent), or 29 . 13 . 8 . 13 . 29, and the laterals merge into marginals at about No. 13. The maxilla is 1·2 mm. in length.

Subfamily *HELICARIONINÆ*.

Genus HELICARION, Férussac, 1821.

Helicarion aethodus, sp. n. (Text-fig. 8.)

Almost exactly like the foregoing in outward appearance, but differing in that the first whorl is sculptured with extremely fine and close, regular, continuous, microscopic, incised spiral lines, which only break up into dots for a very short distance on two or three of the lines; the transverse striæ on the later whorls are a little weaker than in *lactea*.

The shell contains 2½ whorls and measures:—

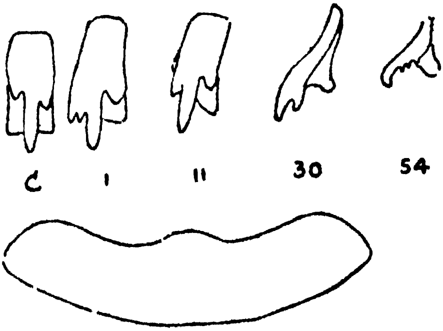
Diam. maj. 11·8, min. 8·6; alt. 5·5; apert. alt. 5·4, lat. 7·0 mm.

Hab. KENYA, Mt. Kenya (*Kemp*).

The strong, practically continuous, spiral lines on the protoconch amply distinguish this species from its near neighbours; in *baringoensis* these lines are fewer and are formed by punctate dots.

The radula measures 2·8 × 1·3 mm. when flattened; its formula is 64 . 1 . 64 × (86 + nascent) or 50 . 14 . 1 . 14 . 50, the laterals merging into marginals at about No. 14; the marginals from 55 to 64 are small and comparatively shapeless. The first lateral is very remarkable in having a pair of inner cusps, a feature so unusual that it might almost be suspected of abnormality, especially as all the centrals are slightly asymmetrical, as shown in the figure. However, the double cusps occur quite evenly and regularly in both the first laterals throughout the whole course of the radula, and do not look at all abnormal, so it seems fairly safe to accept them as correct. The length of the maxilla is 1 mm.

Text-fig. 3.



Helicarion arthodus, Conn., teeth from the radula, × 500, and maxilla, × 58.

I place the species provisionally in *Helicarion*, sensu lato; the combined peculiarities of its radula and embryonic sculpture may eventually prove it to belong to a new subgenus.

Subgenus GYMNARION, Pilsbry, 1919.

Helicarion (*Gymnarion*) *cheranganiensis*, sp. n. (Text-figs. 4 & 5.)

Shell of fair size, subglobose, rimate, thin, smooth, transparent, base and protoconch glossy, remainder rather dull, corneous yellow-brown, gradually becoming paler on the later whorls. Spire not much raised, apex submammillate. Whorls 8½, not very convex, rapidly increasing, the first 1½ practically smooth under 50-fold magnification, remainder covered above and beneath with fairly regular, rather coarse, oblique transverse striæ or growth-wrinkles; suture simple, well defined. Aperture nearly oval, upper and lower margins slightly and equally descending, peristome simple, acute, outer lip, after about 2 mm., receding in a gentle curve to the base, columella concave, upper margin extremely narrowly reflexed, forming a minute rima.

Diam. maj. 15·3, min. 11·6 ; alt. 8·2 ; apert. alt. 6·8, lat. 8·8 mm.

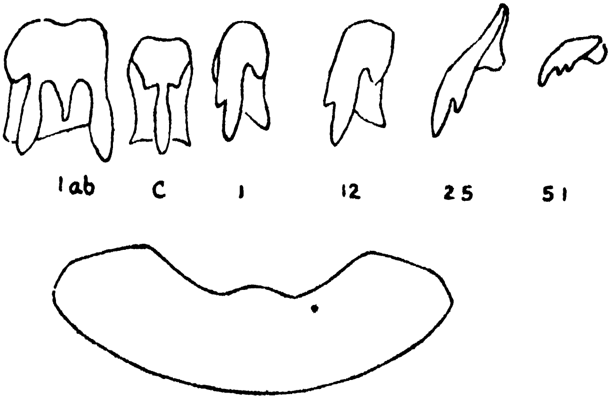
Hab. KENYA, Cherangani Hills, 40 miles east of Mt. Elgon, 6200 ft. (*Capt. C. R. S. Pitman*).

Type in collection of the Rev. C. T. Cribb, to whom I am much indebted for the opportunity of examining several of the species mentioned in this paper.

Text-fig. 4.

Helicarion cheranganiensis, Conn., shell, somewhat enlarged.

Text-fig. 5.



Helicarion cheranganiensis, Conn., teeth from the radula, × about 500, and maxilla, × 37.

The radula measures 3×1½ mm. when flattened; its formula is 51 . 1 . 51×(86+ nascent) or 39 . 12 . 1. 12 . 39, the laterals merging into marginals about No. 12. The first lateral on one side is malformed throughout the radula; the length of the maxilla is 1·4 mm. There is nothing very remarkable about the shell, but its comparative want of gloss and absence of apical spiral sculpture are not found together on any other species which resembles it in form.

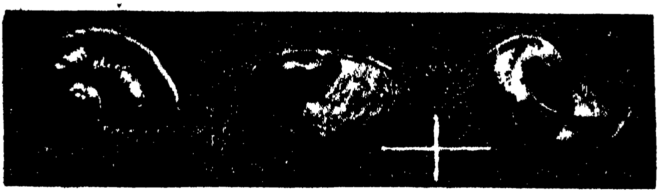
Subgenus GRANULARION, Germain, 1912.

Helicarion (*Granularion*) *pitmani*, sp. n.

(Text-figs. 6 & 7.)

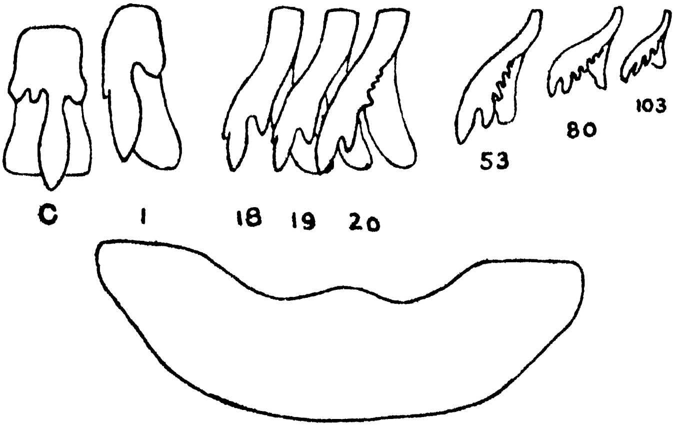
Shell of fair size, subglobose, imperforate, thin, very smooth and glossy, transparent, corneous yellow-brown. Spire nearly flat, apex only just visible in profile. Whorls 3, moderately convex, very rapidly increasing, protoconch practically smooth and glossy under 50-fold magnification, but showing extremely faint and infrequent traces of punctate spiral sculpture, which, however, is more regularly visible on very young shells, remainder very weakly, closely, transversely striate or growth-wrinkled; suture simple, well defined. Aperture nearly circular, upper and lower margins very slightly ascending and descending respectively, peristome simple, acute, outer lip straight for 5½ mm., and then

Text-fig. 6.



Helicarion pitmani, Conn., shell somewhat enlarged.

Text-fig. 7.



Helicarion pitmani, Conn., teeth from the radula, × about 850, and maxilla, × 40.

receding in a curve to the base, columella slightly inclined to the right, without marginal reflexion.

Diam. maj. 14·0, min. 10·2; alt. 8·5; apert. alt. 7·5, lat. 8·7 mm.

Hab. KENYA, Cherangani Hills (*Pitman*).

Type in coll. Cribb.

A very simple shell, noteworthy for its inflated aperture, and not much like any of its neighbours.

Another specimen measures:—Diam. 15·7 × 12·6; alt. 9·2 mm.

The radula measures about 4 × 2·5 mm. when flattened, its formula is 107 . 1 . 107 × (90 + nascent) or 88 . 19 . 1 . 19 . 88; it is very like that of *H. cryptophallus*, Watson (Proc. Mal. Soc. xiv. 1921, p. 100 and pl. iv. fig. 14), of which the description, especially of the marginals, applies very well in the present case. The change to marginals occurs at No. 20, which is the first tooth to show definite serration. The radula figured above has a deformed rhachidian, with a double cusp on one side throughout. The length of the maxilla is 1·7 mm.

Subgenus AFRICARION, Godwin-Austen, 1883.

Helicarion (*Africarion*) *microgranulatus*, Preston, 1912.

1912. *Africarion microgranulata*, Prest., P. Z. S. p. 184, pl. xxxi. fig. 5.
1919. *Helicarion* (?) *microgranulatus*, Prest., Pilsb., Bull. Amer. Mus. N. H. xl. p. 275.

As represented by what is presumably a paratype in the British Museum, the protoconch (1½ whorl) of this species bears very clear, microscopic, punctate spiral lines, which are inclined to run in pairs and extend to the apex. The shells tentatively assigned to *microgranulatus* by Pilsbry are stated to have smooth embryonic whorls, so cannot be conspecific.

Helicarion (*Africarion*) *oscitans*, Preston, 1914.

P. Z. S. p. 788, pl. ii. fig. 15.

The type of this species is little more than half-grown, the largest topotype I have seen measuring: diam. 18 × 14, alt. 10·5 mm. The sculpture of the embryonic whorls is very similar to that of *H. microgranulatus*.

I leave these two species where Preston placed them until their anatomy is known.

I have examined, under about 50-fold magnification, the sculpture on the embryonic whorls of authentic examples of a large number of Helicarioninæ and Vitrininæ, and think it may be of interest to append the results. I make no attempt to assign any of them to the various genera and subgenera in which they have, at various times, been placed:—

(*a*) Embryonic whorls without spiral sculpture.

abyssinicus, Rupp.
cheranganiensis, Conn.
compacta, Preston.
copiosa, Preston.
darnaudi, Pfr.
kempi, Preston.
kiduahensis, Preston.
kivuensis, Thiele.
lactea, Conn.
masukuensis, Smith.
nigrocincta, Mts.
oleosa, Mts.
orestias, Preston.
perfragilis, Preston.
plicatulus, Mts.
schubotzi, Thiele.
sennaariensis, Pfr.
tenebrosa, Preston.
tenuissima, Thiele.
ugandensis, Thiele.

(*b*) Embryonic whorls spirally linearly punctate.

baringoensis, Smith.
bitzeensis, Preston.
concavospira, Preston.
cryptophallus, Watson.
granulosa, Preston.
hians, Rüpp.
insularis, Thiele.
kagambahensis, Preston.
marsabitensis, Preston.
microgranulata, Preston.
nyasanus, Smith.
oscitans, Preston.
pallens, Morelet.
pitmani, Conn. (very faint).
sowerbyanus, Pfr.
sputosa, Preston.
stuhlmanni, Mts.

(*c*) Embryonic whorls engraved with practically continuous spiral lines.

aethodus, Conn.

Subfamily SHELDONIINÆ.

(=*Peltatinæ*, Godwin-Austen.)

Genus SHELDONIA, Ancey, 1888.

(=*Peltatus*, G.-A., 1908.)

Ancey proposed the genus *Sheldonia* in 1888 (Conchologists' Exchange, i. p. 53) for the four South African species *Helix trotteriana*, Bs., *phytostilus*, Bs., *natalensis*, Pfr., and perhaps *cotyledonis*, Bs. He did not nominate the type, and I cannot trace any later nomination. Therefore, I now determine it as the first species in Ancey's list (*H. trotteriana*, Bs.), although, as will be seen, this is not a matter of great importance.

In 1892 Pilsbry (Manual, viii. p. 135) placed *Sheldonia* in the synonymy of *Zingis*, Mts., and it is probably on this account that Godwin-Austen, as well as the present writer, overlooked Ancey's genus.

In 1908 Godwin-Austen founded *Peltatus* (Ann. & Mag. Nat. Hist. (8) i. p. 131) on spirit-material from Port Elisabeth, which had been given to him under the erroneous name of *hudsoniæ*, Bs., but in 1912 (Ann. & Mag. Nat. Hist. (8) ix. p. 131) he discovered and published the fact that its correct name was *aloicola*, M. & P., which, on p. 127, he nominated as genotype. In the later paper he gave more or less full details of the anatomy of *trotteriana*, *natalensis*, and *cotyledonis*, and placed all these, as well as *phytostilus*, in *Peltatus*.

There can hence be no question that *Sheldonia* and *Peltatus* are identical, and Ancey's, being much the older name, must take precedence.

Sheldonia cancellata, sp. n. (Pl. XXVIII. fig. 5.)

Shell comparatively large, globose, subrimate, thin, silky, transparent, corneous red-brown. Spire little raised, apex obtuse. Whorls 4, moderately convex, very rapidly increasing, the last much swollen, embracing nearly the entire shell; the first 1½ smooth and glossy, sparsely micropunctate, with a few growth-wrinkles, the next ½-whorl covered with close, regular, nearly straight, transverse costulæ at right angles to the suture; on the last 2 whorls the costulæ become fainter and gradually further apart, with 3 or 4 fainter striæ in the intervals between them, and are crossed by close, regular, spiral ridges, the whole imparting to the shell, both above and beneath, a beautiful silky sheen; suture simple, well defined. Aperture suboval, more broad than high, descending a little at the base, peristome simple, acute, outer lip nearly straight and not receding in profile, columella weak, concave, margin narrowly, but closely, reflexed, almost concealing the narrow rima.

Diam. maj. 20·2, min. 15·8; alt. 13·2; apert., alt. 10·8, lat. 11·9 mm.

Hab. Cape Province, Knysna (*J. Drury*).

Type in South African Museum, Cape Town.

I place this beautiful shell provisionally in *Sheldonia*, but it differs widely from any known African species, and probably represents, at least, a new subgenus.

Subfamily *SITALINÆ*.

Genus SITALA, H. Adams, 1865.

Sitala urguessensis, sp. n. (Pl. XXVIII. fig. 6.)

Shell small, conoid, subrimate, thin, smooth, semi-transparent, pale corneous brown. Spire elevated, sides slightly convex, meeting at just less than a right angle, apex acute. Whorls 6, convex, regularly, but not very rapidly, increasing, very slightly bluntly angled at the periphery, sculptured all over, almost to the extreme apex, with very close, fine, microscopic spiral striæ, and, after the first 2 whorls, with close, faint, slightly curved and oblique transverse striæ, stronger at intervals in the lines of growth and cut by the spiral sculpture ; suture subcrenulate, well defined. Aperture ¾-lunar, peristome simple, acute, outer lip receding a little to the base, columella slightly concave, margin very narrowly reflexed, forming a minute rima.

Diam. maj. 4·1, min. 3·9 ; alt. 4·1 ; apert., alt. 1·7, lat. 1·75 mm.

Hab. KENYA, Urguess (*Percival*).

Differs from both *Sitala ariel* * and *S. iredalei*, Preston, in having a comparatively more elevated spire and more transparent corneous texture.

Family **Endodontidæ.**

Genus TRACHYCYSTIS, Pilsbry, 1893.

Trachycystis rubra, sp. n. (Pl. XXVIII. fig. 7.)

Shell of fair size, globose, imperforate, thin, moderately glossy, translucent, bright rufous corneous. Spire depressed, apex obtuse. Whorls 6, regularly increasing, moderately convex, rounded at the periphery, protoconch, 1½ whorls, strongly microscopically spirally costulate almost to the apex, remainder covered on the upper side with close, regular, nearly straight costulæ at right angles to the suture, more distant, with weaker striæ between and parallel to them, on the last whorl, crossed by close, regular, shallow spiral grooves ; this sculpture continues more faintly on to the under side, disappearing around the extreme base ; suture simple, well defined. Aperture semilunar, descending slightly at base, peristome simple, acute, outer lip nearly straight and perpendicular in profile, columella weak, concave, margin extremely narrowly thickened.

Diam. maj. 10·0, min. 9·2 ; alt. 7·8 ; apert., alt. 5·1, lat. 5·5 mm.

Hab. CAPE PROVINCE, Oudebosch, Caledon Div. (*K. H. Barnard*).

Type in South African Museum, Cape Town.

While at first glance *T. rubra* might be mistaken for a ruby-coloured variety of *T. tollini* (Albers), which it resembles closely in form, the sculpture is very different, the transverse striation, in *tollini*, being much weaker, and the spirals stronger than in the new species.

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* *Phortion ariel*, Preston, Ann. & Mag. Nat. Hist. (8) vi. p. 531 (1910).

Trachycystis eupleura, sp. n. (Pl. XXVIII. fig. 8.)

Shell rather small, depressed orbicular, widely umbilicate, thin, asperate, translucent, normally dark corneous brown. Spire but little raised, apex small, rounded, hardly visible in profile. Whorls 4½, regularly increasing, fairly convex, rounded at the periphery, the first micropunctate, remainder covered all over with strong, slightly curved, very oblique transverse costæ, the interstices between which on the last 3 whorls being occupied by about 4 parallel transverse striæ; suture simple, rather deep. Aperture ⅘-lunate, peristome simple, acute, outer lip nearly straight in profile, receding considerably to the base, columella erect, upper margin only slightly reflexed, not overhanging the umbilicus, which is rather wide, extending to the summit and just exposing each whorl.

Diam. maj. 4·8, min. 4·1; alt. 2·2; apert., alt. 1·9, lat. 1·8 mm.

Hab. Cape Province, Majuba Nek, Herschel Dist. (*J. Hepburn*).

Type in Albany Museum, Grahamstown.

A member of the group comprising *T. petrobia* (Bs.) and *simplex*, *lignicola*, and *spissicosta*, M. & P., than all of which its perforation is wider and costulation stronger. *T. permeata*, M. & P., resembles the new species in perforation, but has a comparatively more elevated spire and an angulate periphery. The largest example seen of *T. eupleura* measures 5·4 mm. in major diameter.

Trachycystis bernardinæ, sp. n. (Pl. XXVIII. fig. 9.)

Shell minute, depressed orbicular, rather widely umbilicate, thin, silky, corneous brown. Spire almost flat, apex only just visible in profile. Whorls 4, rather convex, regularly increasing, rounded at the periphery; protoconch, 1¼ whorl, microscopically punctate, remainder covered all over with close, regular, slightly curved and oblique transverse costulæ; suture simple, rather deep. Aperture nearly a complete circle, peristome simple, acute, without columellar reflexion; umbilicus deep and rather wide, exposing all the whorls; callus white and narrow.

Diam. maj. 2·3, min. 2·0; alt. 1·1 mm.

Hab. KENYA, Solai Forest, Mt. Kenya, 7–9000 ft. (*Kemp*). The costulæ are much stronger than in *T. iredalei*, Preston, while they are closer and the umbilicus wider than in *imitata*, Smith.

Trachycystis igembiensis, sp. n. (Pl. XXVIII. fig. 10.)

Shell minute, suborbicular, umbilicate, thin, silky, type corneous yellowish white, but possibly somewhat faded. Spire depressed conic. Whorls 4, very convex, regularly increasing, protoconch, 1½ whorl, rather coarsely microscopically spirally punctate almost to the apex, remainder sculptured all over with weak, rather distant, curved, oblique transverse costulæ, between which are 2 or 3 extremely weak transverse striolæ cut by coarse, close, spiral striæ; suture deep. Aperture suboval, a little more broad than high, peristome simple, acute, without columellar reflexion, umbilicus not very wide, but deep and rather open, exposing all the whorls.

Diam. maj. 1·7, min. 1·5; alt. circa 1·0 mm.

Hab. KENYA, between the Igembi Hills and Nyeri (*Kemp*).

Easily distinguishable by its spiral sculpture from any of its neighbours.

Trachycystis chondrocycloides, sp. n. (Pl. XXVIII. fig. 11.)

Shell of moderate size, depressed conoid, umbilicate, bleached and opaque in the type. Spire moderately elevated, sides gradate, apex mammillate. Whorls 4½, regularly increasing, very convex, rounded at the periphery, the first 1½ smoothly micropunctate, remainder covered all over with close, regular, rather coarse, curved, oblique transverse striæ; suture simple, rather deep. Aperture nearly circular, peristome simple, outer lip receding sharply in profile to the base, making with the suture an angle of about 45°, columella erect, concave, margin rather broadly triangularly reflexed, but not overhanging the umbilicus, which is wide and deep; callus well defined.

Diam. maj. 6·2, min. 5·7; alt. 4·0; apert., alt. 2·2, lat. 2·2 mm.

Hab. CAPE PROVINCE, 1 mile north of Port Nolloth (*Rogers*).

Type in South African Museum, Cape Town.

All specimens collected are bleached and calcined, and the species may be extinct, but it is very different from any yet described from Africa, being remarkable for its tumid gradate whorls and mammillate apex. In one or two examples the peristome is continuous, when the shell bears suspiciously close resemblance to that of a *Chondrocyclus*, but I think that, if ever found in better condition, it will prove to be of brown colour and corneous texture, and correctly placed in *Trachycystis*.

Trachycystis planissima, sp. n. (Pl. XXVIII. fig. 12.)

Shell very small, depressed orbicular, widely umbilicate, thin, asperate, brownish corneous. Spire scarcely raised, each whorl just showing in profile above the next, apex rounded. Whorls 4, convex, regularly increasing, rounded at the periphery, first 1½ smoothly micropunctate, remainder covered all over with strong, close, curved, oblique transverse costulæ, gradually increasing in distance apart, the intervals between them on the later whorls interspersed with from 2 to 4 microscopic transverse striæ; suture simple, deep. Aperture nearly circular, peristome simple, outer lip receding a little in profile to the base, columella erect, margin scarcely reflexed, umbilicus wide and deep, exposing all the whorls to the summit.

Diam. maj. 3·0, min. 2·7; alt. 1·5; apert., alt. 1·0, lat. 1·0 mm.

Hab. Cape Province, Verkeerde Vlei, Carnarvon District (*M. F. Day*).

A small flat shell, with very convex whorls and strong close costulation.

Genus Endodonta, Albers, 1860.

Endodonta kempi, sp. n. (Pl. XXVIII. fig. 13.)

Shell minute, flattened orbicular, deeply umbilicate, thin, semitransparent, corneous reddish brown. Spire flat. Whorls 5, very convex above, rounded at the periphery, slowly and regularly increasing, the first 2½ faintly micropunctate, remainder covered with close, weak, regular, straight microscopic striæ, at right angles to the deep suture, and extending on the base into the umbilicus, which is deep and moderately wide, exposing all the whorls. Aperture ⅓-lunate, descending a little at the base; peristome simple, acute, outer lip straight and vertical in profile, columella weak, margin not reflexed. On the inner side of the outer wall, within a distance of 1·8 mm. from, and parallel to the outer lip, are 3 short, equidistant, curved white septæ, 2 of which are plainly visible within the aperture, while all can be clearly seen through the outside of the shell.

Diam. maj. 1·5, min. 1·4; alt. 0·9 mm.

Hab. KENYA, Igembi Hills, 6000 ft. (*Kemp*).

The vertical septæ appear to separate this wonderful little shell from any other known species; I place it provisionally in *Endodonta*, sensu lato, until its anatomy is known.

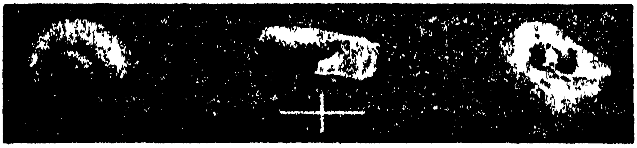
Family **Helicidæ**.

Genus HALOLIMNOHELIX, Germain, 1913.

Halolimnohelix plana, sp. n. (Text-fig. 8.)

Shell rather small, umbilicate, depressed globose, thin, dull, hairy, transparent, pale brownish yellow, corneous. Spire flat. Whorls 5, rather rapidly increasing, moderately convex, somewhat shouldered above, and rounded at the periphery, the first smooth, remainder sculptured all over with fairly regular, rather coarse, oblique transverse striæ, and irregularly, rather sparsely, planted with long, thin, curved, hairy spines, a little shorter and more numerous on the base and continuing almost into the umbilicus; suture simple, well defined. Aperture nearly circular, ascending a little above from the suture and descending at the base, peristome simple, acute, outer lip straight and receding· somewhat in profile, columella concave, margin narrowly reflexed, not obscuring the umbilicus, which is not wide, but very deep.

Text-fig. 8.



Halolimnohelix plana, Conn., shell, somewhat enlarged.

Diam. maj. 11·0, min. 8·3; alt. 5·0; apert., alt. 5·0, lat. 5·1 mm.

Hab. KENYA, Cherangani Hills (*Pitman*).

Type in coll. Cribb.

Easily distinguishable from any hairy species yet described from Central Africa by reason of its dead-flat spire, lower than the upper margin of the peristome. Its anatomy proves it to be congeneric with various species which Pilsbry has attributed to *Halolimnohelix*.

obliquely striate in the lines of growth; suture shallow, simple. Aperture irregularly quadrate, rounded at base, peristome simple, acute, outer lip curved outward, nearly straight in profile, receding a little to the base; columella straight, erect, margin triangularly reflexed over the narrow umbilicus.

Alt. 20·2, lat. 12·6; apert., alt. 9·8, lat. 6·7; last whorl 14·5 mm.

Hab. Kenya, Taru Desert (*Percival*).

A brightly coloured shell with broader contour than its confrères. This broad contour leads me to attribute it to *Rhachidina*, but its colour-scheme is more like that of some species of *Rhachistia* *.

Genus Conulinus, von Martens, 1895.

Conulinus athiensis, sp. n. (Pl. XXVIII. fig. 18.)

Shell of moderate size, elongate-turriform, subrimate, somewhat dull and faded in the type, but normally probably smooth, shining, translucent, dark corneous brown. Spire produced, sides very slightly convex about the 5th whorl, apex acutely rounded. Whorls 8, rather flat, regularly and gradually increasing, the apical smooth but for faint microscopic punctation, remainder smoothly transversely striate, showing considerable microscopic malleation; suture very shallow, but clear. Aperture subovate; peristome simple, acute; outer lip only slightly outcurved; columella almost straight, upper margin very narrowly thickened in such manner that the rima is practically non-existent.

Long. 14·2, lat. 4·5; apert., alt. 4·3, lat. 2·1; last whorl 6·7 mm.

Hab. Kenya, Athi Plains (*Percival*); Mt. Kenangop (*Kemp*).

An immature shell from Mt. Kenangop, which may have been distributed under the name of that mountain, is attributable to the present species and adds to our knowledge of its characters and distribution. It contains 6½ whorls, with a length of 9·5 mm.

From its locality and general appearance, ***athiensis*** might seem at first sight akin to *C.* ***nakuroensis***, Dautz., another smooth elongate shell, which I have not seen, from much the same neighbourhood. On careful examination, however, of Dautzenberg's figure and description, the two species should be entirely distinct—an opinion in which that author concurs.

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* ***Rhachistia***, Conn., Trans. Roy. Soc. South Africa, xii. 1925, p. 103. Type, ***R. rhodotænia***, Mts.

Conulinus prestoni, nom. nov.

Buliminus ugandæ, Preston, 1912[*], is antedated by *Buliminus ugandæ*, von Martens, 1895: both appear to belong to *Conulinus*. I therefore rename Preston's species after its author.

Conulinus daubenbergeri (Dautzenberg), 1908.

1908 *Mabilliella daubenbergeri*, Dautz., J. de C. lvi. p. 10, pl. i. figs. 11 13.
1910. *Mabilliella daubenbergeri*, Dautz. (= *Conulinus percivali*, Preston), Germ., Bull. Mus. Paris, xxv. p. 263.

This species has been wrongly attributed to *Mabilliella*, which is probably an Achatinoid genus, and which has a far larger apex, totally devoid of spiral sculpture, but furnished almost to the tip with coarse transverse wrinkles, stronger just below the suture and developing on the later whorls into close, regular, nearly vertical costulæ. The umbilicus, in immature specimens of *M. notabilis* (Smith) is much narrower than in *C. daubenbergeri* of equal size, and does not show the peculiar circum-umbilical angulation which is observable in *daubenbergeri* and full-grown examples of *notabilis*. In my opinion *C. daubenbergeri*, as figured by Dautzenberg, is very nearly, if not quite mature, and would never grow into anything in the least resembling an adult *Mabilliella*. It is nearly allied to *C. ugandæ* of von Martens, which that author placed in *Conulinus*, so it may be best to place *daubenbergeri* in the same genus, though rather an aberrant member thereof, until proof is found to the contrary. *Conulinus percivali*, Preston, is only a manuscript name, but as it has now appeared in print it must date from 1919; I agree with Germain's synonymy. The localities for the species are Kibosho (*Daubenberger*); Kekumega; banks of R. Yala (*Babault*), and Urguess (*Percival*) in Kenya Colony, and Kibonoto and Mt. Meru (*Sjöstedt*) in Tanganyika Territory.

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[*] Rev. Zool. Africaine, i. p. 323.

The other described members of this rather specialized group are:—

Conulinus ugandæ (Mts.), 1895.

1897. *Buliminus* (*Conulinus*) *ugandæ*, Mts., D. O. A. p. 65, pl. iii fig. 33.

Hab. UGANDA, Monyonyo (*Stuhlmann*).

Also collected by Percival at Urguess, whence it was distributed by Preston before the war, bearing as a manuscript name the Latin word for "brother"

Conulinus rutshuruensis (Pilsbry), 1919.

1919. *Pachnodus rutshuruensis*, Pilsb., Bull. Amer. Mus. N. H. xl. p. 307, fig. 156.

Hab. BELGIAN CONGO, Rutshuru; Penge (*Bequaert*).

Also collected by Kemp at Kampala, Entebbe and Jinja, in Uganda, and distributed by Preston under the manuscript name of the first-mentioned locality.

Conulinus nyiroensis, sp. n. (Pl. XXVIII. fig. 19.)

Shell rather small, acuminate ovate, umbilicate, thin, smooth, glossy, transparent, corneous yellow-brown. Spire produced, sides slightly convex, apical angle just exceeding 45°, apex mammillate. Whorls 5, convex, rounded at the periphery, rather rapidly increasing, the first sculptured nearly to the apex with very fine, close, microscopic spiral lines, which continue more faintly, cutting equally fine and close oblique transverse striæ on the second whorl and then fade away; remainder covered with regular, slightly distant and oblique, transverse striæ; suture simple, slightly impressed. Aperture subrhomboidal, peristome simple, acute, outer lip straight in profile, receding a little to the base, columella erect and long, angulate near its base a short way within the aperture, margin broadly triangularly reflexed, half covering the deep, but rather narrow, umbilicus.

Long. 10·8, lat. 6·3; apert., alt. 4·7, lat. 3·1; last whorl 8·2 mm.

Hab. KENYA, Mt. Nyiro, S. of Lake Rudolph, 8300 ft. (*Percival*).

Although this little species may, perhaps, be immature, it certainly bears a very finished appearance. It is readily distinguishable from other members of the *daubenbergeri* group by its more ovate and compact form and comparatively shorter diameter.

Family **Pupillidæ**.

Subfamily VERTIGININÆ.

Genus GASTROCOPTA, Wollaston, 1878.

Gastrocopta insulsa (Preston), 1913.

1913. *Ennea insulsa*, Prest., P. Z. S. p. 206, pl. xxxiii. fig. 13.

This species is almost identical in form and dentition with *G. damarica* (Ancey). In the latter, however, the sculpture on the later whorls consists of faint, fairly close and regular, oblique transverse striolæ, while in *insulsa* the striæ are considerably stronger and further apart, with smoothly punctate surface between them. An additional locality for this species is TANGANYIKA TERRITORY, Dar-es-Salaam (*Connolly*).

Gastrocopta damarica (Ancey), 1888.

1888. *Pupa damarica*, Ancey, Le Naturaliste, x. p. 200.
1894. *Pupa microbus*, Morelet, Dautz., Bull. Soc. Zool. Fr. xix. p. 129, pl. i. fig. 5.

Monsieur Dautzenberg concurs in my opinion that these two species are identical, and *microbus* must be relegated to synonymy. It was described from Senegal and *damarica* from Ovampoland, so that the latter's extended distribution northward up the west coast seems quite reasonable.

EXPLANATION OF PLATE XXVIII.

Fig. 1. *Thapsia oscitans*, Conn., type.
Fig. 2. —— *germaini*, Conn., type.
Fig. 3 *Gudeella tricolor*, Conn., type.
Fig. 4. *Trochozonites adorus*, Conn., type.
Fig. 5. *Sheldonia cancellata*, Conn., type.
Fig. 6. *Sitala urguessensis*, Conn., type.
Fig. 7. *Trachycystis rubra*, Conn., type.
Fig. 8. —— *eupleura*, Conn., type.
Fig. 9. —— *bernardinæ*, Conn., type.
Fig. 10. —— *ngembiensis*, Conn., type.
Fig. 11. —— *chondrocyclodes*, Conn., type.
Fig. 12. —— *planissima*, Conn., type.
Fig. 13. *Endodonta kempi*, Conn., type.
Fig. 14. *Halolimnohelix iredalei*, Conn., type.
Fig. 15. —— *viatoris*, Conn., type.
Fig. 16. *Cerastus retirugis*, Mts.
Fig. 17. *Rhachidina festiva*, Conn., type.
Fig. 18. *Conulinus athiensis*, Conn., type.
Fig. 19. —— *nyiroensis*, Conn., type.

LII.—*The Fauna of the Arctic Island of Jan Mayen and its probable Origin.* By W. S. Bristowe, B.A.

The name Jan Mayen is probably unfamiliar to most people, but an examination of an atlas will show that it is a small island 30 miles long, in shape reminding one somewhat of a mutton cutlet, situated roughly 300 miles north of Iceland, the same distance east of Greenland, and twice that distance west of Norway. The island owes its existence to a great volcanic upheaval, which took place probably in Quaternary times, and, as it has ever been in this isolated position, any animals or plants which live there are of considerable interest, for by some means they must have reached it across a large expanse of Arctic Ocean. Mists frequently envelop the numerous mountain peaks, and, as one approaches, the lower slopes look bare save for the patches of bright yellow moss, which give it an almost eerie appearance. The island gives but a cold and unforbidding welcome to visitors. It almost seems strange that any forms of life, which have by some strange chance reached these desolate shores, should manage to carry on their existence under such conditions—yet here Arctic foxes and birds of many kinds abound, while insects and also many species of plants are numerous.

The presence of birds is easy to explain, the foxes have presumably reached the island by means of the ice-bridge which connects up the island with the east coast of Greenland in winter months, but a further study is required to explain the origin of the insects and plants. In the 'Proceedings of the Cambridge Philosophical Society,' vol. xxi. p. 38 (1922), I gave a short account of the insects and arachnids which I collected there during a month's stay on the island in August 1921. Since publishing the above paper the rest of the insects in my collection have been identified, and in the present paper I give a list of all the insects and arachnids recorded from Jan Mayen up till now. An examination of their known distribution helps us considerably, when we turn to the methods by which they could have reached the island. In the first place, we can see that, whereas very few of the Jan Mayen species occur in Iceland, in spite of its comparative proximity, quite a number have been recorded from Greenland, but that the closest affinity is with Europe. A glance at the wingless forms shows us that, with the exception of one mite and one "spring-tail," all have been found in Europe. Coming to the winged forms, however, we find that, whereas all the ichneumons, moths, and brachycerous flies are European, only four of the fourteen nematocerous flies have been recorded from Europe, while seven have been found either in Greenland or America. It is true that Arctic insects have not been thoroughly collected everywhere, but the Arctic Nematocera are known as well as most other groups; so our present knowledge points to the conclusion that this group, speaking in general terms, has by some means reached Jan Mayen from the west and the remainder from Europe.

On the shores of Jan Mayen immense piles of driftwood are thrown up every year. This driftwood is almost certainly the means whereby the greater number of species of insect and arachnid have crossed the sea which separates the island from Europe. This timber is carried down the large Siberian rivers to the sea, and here the powerful westerly current, which explorers have endeavoured to make use of for drifting across the North Pole, takes possession of it*. Some is thrown up on the shores of Nova Zemlya and Spitsbergen, but a large percentage crosses the Arctic Ocean to Jan Mayen and Greenland. The eggs of spiders enclosed in their waterproof silken coverings, the eggs of insects, their larvæ, pupæ, or even in some cases the imagos themselves when concealed in cracks in the timber, and, perhaps, frozen in by ice, have probably been able to cross the sea. That the eggs and larvæ of insects can be frozen hard without being killed is a well-known fact †; indeed, if Arctic insects are to survive at all, it is essential that at some stage in their life-histories they should be able to resist being frozen with impunity.

We can now understand why it is that the Jan Mayen fauna has such close affinities with northern Europe, and also, as one would expect, with Nova Zemlya, Spitsbergen, and Greenland. The fact that the bulk of the driftwood passes in a westerly direction north of Bear Island, and then later down the coast of Greenland west of Iceland, further explains why so few species found in Jan Mayen should have reached Bear Island or Iceland.

When we were making plans for our small expedition from Cambridge to go to Jan Mayen in 1921, we heard that a Norwegian party were also going there with the intention of setting up a wireless station which would be able to send warning to Europe of approaching storms from the north-west, and through the kindness of their leader, Mr. Ekerold, we were able to combine forces with them. These violent gales from the north-west may quite possibly catch the light-bodied nematocerous flies and carry them across the sea from Greenland to Jan Mayen. The eggs or larvæ of others may, of course, have been brought from Europe in the driftwood. Spiders in the Arctic do not appear to resort to ballooning excursions as they do in warmer climates, or, no doubt, they would be caught up similarly. It seems to me doubtful whether the nematocerous imagos could survive the exposure of such a journey, but, perhaps, where a gravid female is concerned, the eggs can develop after the death of the parent.

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* Perhaps this westerly current may have brought the eggs of scavenging insects like *Cynomyia* and *Scatophaga* to Jan Mayen in the dead bodies of animals and birds.

† Mr. Porsild of Disco (Greenland) tells me he has frozen lepidopterous larvæ until they are brittle like twigs, but that on being thawed they have started to walk about again as usual. In Spitsbergen Mr. Elton hatched the larvæ of the nematocerous fly *Cricotopus glacialis*, F. W. Edw., from eggs which had been frozen (Ann. & Mag. Nat. Hist. vol. x. p. 193, 1922).

Bird-transport is another means by which insects may possibly have reached Jan Mayen from Greenland, but, except in the case of creatures actually parasitic, this does not seem to me to be a very important factor. The tick—*Ixodes ricinus*, Linn. (*I. sulcatus*, Koch)—was captured by the Austrian Expedition of 1883 on *Anthus aquaticus*, Bechst., and we found *Ixodes putus*, O. P.-C., breeding in great numbers along the cliffs frequented chiefly by Brünnich guillemots and puffins.

Human agency in all probability has not been a great factor in the importation of insects, for the island is uninhabited, and, with the exception of occasional trappers, who spend a winter there trapping foxes, it is seldom visited now, though during the seventeenth century it was used as a whaling centre. *Fannia incisurata* (the lesser housefly) was recorded by the Austrian Expedition *, but since it has not been found elsewhere in Arctic regions, and some diligent search on my part did not bring it to light, it seems probable that it was imported by the Austrians, but that it could not stand the climatic conditions.

As regards the flora, Mr. J. L. Chaworth Musters, who made a thorough collection of the flowering plants and compiled a list of more than forty species, is of the opinion that they are entirely of European origin. Most of the species are common both to North Europe and Greenland, but whereas in the former they are widespread, in the latter they are not. A variety of the pretty little mauve saxifrage, *Saxifraga oppositifolia*, L., on Jan Mayen is interesting, in so far that it has previously been found only in East Greenland. Now this might at first seem to demonstrate that Greenland was its place of origin, were it not for the fact that another variety unknown in Greenland and intermediate between this and the typical form occurs on Jan Mayen. This seems to point to the fact that the variety reached Greenland from Jan Mayen.

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* 'Österreichische Polarstation Jan Mayen, 1882-83,' Vienna, 1886.

Since only two of the plants—*Taraxacum officinalis*, Web., and *Salix herbacea*, L.—possess seeds modified for wind-distribution, and since none produce berries likely to tempt birds, the problem of the means by which the plants have reached Jan Mayen seems to be very similar to that of the insects and arachnids, and we must look to the sea-currents and driftwood for an explanation.

Summary.

Taking into account the very great affinity which exists between the fauna and flora of Jan Mayen and that of North Europe, it seems probable that the westerly Arctic current has brought them to Jan Mayen with the driftwood, or, perhaps, in the case of the plants, the seeds themselves have drifted there in this current or enclosed in ice.

In conclusion, I must express my gratitude to several eminent authorities who have given me such great help by identifying my specimens:—Prof. G. H. Carpenter and Miss Phillips the Collembola, Mr. J. E. Collin and Mr. F. W. Edwards the Diptera, Mr. C. Morley the Ichneumonidæ, Dr. A. Randell Jackson and the Rev. J. E. Hull the Arachnida.

The following literature has been published concerning Jan Mayen since our return:—

(1) W. S. Bristowe. "The Insects and Arachnids of Jan Mayen." Proc. Camb. Phil. Soc. vol. xxi. pt. 1 (1922). This contains notes on the natural history, and makes mention of a few forms collected in the freshwater lagoons. I have nowhere mentioned the fact that I collected some small Oligochæte worms on the island.

(2) J. M. Wordie. "A Summer Visit to Jan Mayen." 'Nature,' January 5th, 1922.

(3) ——. "Jan Mayen Island." Journal of the Royal Geographical Society, March 1922. Mr. J. M. Wordie, the geologist of the party, here deals chiefly with the geology and history of the island.

(4) F. W. Edwards. "The Nematocerous Diptera of Jan Mayen." Ann. & Mag. Nat. Hist. vol. xi. p. 235 (1923). In this paper Mr. Edwards records the nematocerous flies in my collection, and includes a few of my notes on the natural history.

(5) Dr. P. L. Mercanton. "La première ascension du Beerenberg de Jan Mayen." L'Echo des Alpes, no. 8, p. 269 (1924). Dr. Mercanton, who joined us in Norway, led the party which climbed the large extinct volcano of Beerenberg (8100 feet). This was the first time it had been ascended.

Complete List of all Insects and Arachnids recorded from Jan Mayen †.

	Arctic Europe	Europe.	Spitsbergen.	Bear Island	Greenland.	Arct. America.	Iceland.
ARANEÆ.							
Coryphæus holmgreni, L. K.‡	*	*	*	*			
Hilaira frigida, Thor.	*	*	..	..	*	*	
Micryphantes nigripes, Sim.‡	..	*	*				
Erigone tirolensis, L. K.‡	*	*	*				
Micronetia sp.?, imm.‡							
ACARINA.							
Schærozetes notatus, Thor.§	*	*	*	*	*		
Hermannia reticulata, Thor.§	*	*	*	*	*		
Nothrus peltifer, C. L. K.§	*	*	..	*			
Cyrtolælops kochii, Trag.‡	*	*	..	..	*		
Scutovertex lineatus, Thor.	*	*	*				
Ceratoppia bipilis, Herm.	*	..	..	..	*		
Rhagidia gelida, Thor.	*	*	*	..	*		*
Cyta brevirostris, L. K.	*	*	..	..	*		
Bdella littoralis, Linn.	*	*	*	..	*	..	*
—— *decipiens*, Thor.§	*	*	*	.	..	*	
—— *grœnlandica*, Trag.§	..	..	..	..	*		
Penthaleus insulanus, Thor.§	*	..	..	*	*		
Ixodes ricinus, Linn.§	..	*	..	..	..	*	
—— *putus*, O. P.-C.‡	..	*	..	..	*	*	*
Zercon triangularis, C. L. K.§	..	*	..	..	..	..	*
COLLEMBOLA.							
Xenylla humicola, Fab.	*	*	..	..	*	*	
Onychiurus armatus, Tull.‡	*	*	..	..	*		
—— *duodecimpunctatus*, Fol.‡	..	..	.	..	..	*	
Isotoma sensibilis, Tull.‡	*	*	..	..	..	*	
—— *viridis*, Bour.	*	*	..	..	..	*	
—— *grisescens*, Sch.‡	*	*	*	..	*	*	
Sminthurides aquaticus, Bour.‡	..	*					
Sminthurinus niger, Lubb.‡	*	*					

ICHNEUMONIDÆ.							
Stenomacrus intermedius, Hlgr.‡	..	*					
—— *cubiceps*, Thor.‡	..	*					
LEPIDOPTERA.							
Plutella cruciferarum, Zell.§	*	..	*	..	..	..	*
Agrotis ypsilon, Hufn.§	*	..	..	..	..	*	
DIPTERA: (i.) BRACHYCERA.							
Fannia incisurata §	..	*					
Cynomyia mortuorum ‡	*	*	..	..	*		
Limnophora alpica ‡	..	*					
—— *megastoma*	*	..	*				
Scatophaga varipes ‡	*						
—— *nigripes* ‡	*	*	*	..	*		
Acroptera frontata ‡	..	*	*	..	*		
(ii.) NEMATOCERA.							
Sciara tridentata, Rubs.‡	..	..	*	..	*		
—— *bicolor*, Mg.§	..	*					
—— *globiceps*, Bech.							
Erechia frigida, Holmg.	*	..	*	*	* ?	*	
Scatopse pulicaria, Lw.§	*	*	..	..	..	*	
Diamesa aberrata, Lund.‡	..	.	..	.	*	*	
Cricotopus basalis, Stæg.‡	..	..	*	*	*	.	*
Orthocladius conformis, Holm.‡	..	..	*				
—— ? *pleuralis*, Mall.‡	.	..	..	..	..	*	
Camptocladius incertus, Bech.§	..	..	*				
—— *lasiophthalmus*, Mall.‡	..	..	..		..	*	
Metriocnemus callosus, Bech.	..	..	..	* ?			
Trichocera maculipennis, Mg.§	*	*	..	.	*	*	*
—— *lutea*, Bech.	..	..	..	*			
Total 53	28	33	19	9	22	15	7

† I believe I have omitted a louse recorded by the Austrians.

‡ Species not previously recorded.

§ Species previously recorded, but not found by me.

LIII.—*A new Genus and Two new Species* of Reduviidæ (*Heteroptera*) *from Australia.* By W. E. China, B.A.

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The following descriptions were made partly from British Museum material and partly from material sent to the Imperial Bureau of Entomology by Mr. G. F. Hill of the Victorian National Museum, Melbourne. Type-specimens remain in the British Museum, but paratypes have been returned to the Victorian National Museum.

Subfamily *Harpactorinæ*.

Orgetorixa, gen. nov.

Head moderately longly cylindrical, distinctly longer than the pronotum, anteriorly between the antennæ produced into a strongly laterally compressed process extending beyond the apex of the tylus, and anteriorly depressed so that its ventral surface below its apex touches the dorsal ridge of the tylus; anterior lobe (including eyes) distinctly longer than the posterior lobe; ocelli moderately large, facing laterally, nearer to the eyes than to one another; above covered more or less sparsely with short setigerous tubercles, between the ocelli obsoletely sulcate, below unarmed except for a few scattered hemispherical tubercles laterally; tylus strongly compressed and produced forward well beyond the apices of the juga, its anterior edge somewhat gibbous; rostrum more or less parallel and moderately close to the gula, the basal joint short, extending to the middle of the eyes, second twice as long as the first, extending a little beyond the base of the head; bucculæ not at all prominent, extending to anterior margin of eyes; antennæ moderately slender, similar in both sexes, first joint rather thickened, about as long as the head, without granules or tubercles, second joint slightly more than half the length of the first and much more slender, third joint slightly longer than the second and distinctly thicker, fourth about two-thirds the length of the third and equally thick. Pronotum more or less regularly covered with small granules, anterior angles obliquely produced into two stout spines; anterior lobe in middle behind the base of the head, provided with two strongly elevated tubercles sloping anteriorly and terminating in shining rounded knobs; humeral angles produced into two moderately short, horizontally-directed, blunt spines; posterior margin deeply trapezoidally emarginate. Scutellum longer than wide at base, broadly foveolate basally, the apex slightly globulose and constricted from remainder by a broad furrow. Hemelytra extending to the apex of the abdomen in ♂ but not in ♀, discal cell narrow and elongate, broader anteriorly than posteriorly; membrane with interior basal cell absent. Abdomen narrow and moderately elongated, not at all expanded laterally or dilated into lobes, the lateral margins of the connexivum just visible (in ♂) beyond costal margins of elytra and armed with irregular-sized small setigerous granules; posterior lateral angles of segments not at all prominent. Prosternum laterally foveolate; mesosternum on the anterior lateral margin with a rather indistinct small nodule overlapping the posterior margin of the prosternum. Venter distinctly flattened on the disc, not at all carinate medianly. Anterior and intermediate femora longer than the tibiæ, hind femora and tibiæ subequal in length; all femora above with a few scattered setigerous granules and towards the apex with one or two obscure swellings; anterior femora slightly cylindrically incrassate, below towards the apex with a single strong spine-like tooth; anterior tibiæ rather compressed laterally, above near the apex with a peculiar thickened tooth-like projection; intermediate and hind tibiæ rather thickened at the apex,

Genotype, *Orgetorixa australica*, sp. n.

Allied to *Henricohahnia*, Bredd., but readily distinguished by the longer narrower form, the long smooth basal antennal joints, the anterior lateral pronotal spines, the two strong tubercles on the anterior pronotal lobe, the horizontally-spined humeral angles, the practically unarmed legs, the absence of the interior basal cell of the membrane, the non-carinate venter, etc.

Orgetorixa australica, sp. n.

♂. Dark ferruginous-brown, covered with a very short, rather tomentose, greyish pubescence. Apex of anterior process of head black; antennæ with the two basal joints ferruginous, the apex of the second and the third and fourth joints fuscous; basal joint with two obscure annulations and the apex more obscurely ochraceous; rostrum with the second joint ochraceous and the third fuscous. Prosternal xyphus pale ochraceous; metasternum and venter pale ferruginous. Scutellum ferruginous, paler at the apex. Clavus and membrane fuscous. All tibiæ with three obscure ochraceous annulations; middle and hind femora with two obscure ochraceous annulations.

Total length 12·5 mm., breadth across humeral spines 3·3 mm.

♀. Similar to ♂ but larger, the hemelytra not reaching the apex of abdomen; connexivum extending beyond the costal margins but not at all dilated or lobed, ferruginous with the basal third of each segment laterally, obscurely luteous. Pygofer apically strongly bisinuate.

Total length 13·7 mm., breadth across humeral spines 3·7 mm.

1 ♂, 2 ♀ ♀, N. S. Wales, Sydney (*J. J. Walker*).

2 ♂ ♂, Victoria (*G. F. Hill*).

Subfamily *ACANTHASPIDINÆ*.

ARCHILESTIDIUM, Breddin.

Deutsch. Ent. Zeits. 1900, p. 175.

Genotype, *A. ornatulum*, Bredd., N. S. Wales.

Archilestidium cinnabarinum, sp. n.

♂. Head dull purple-black, a small obscure spot on each side of the posterior lobe between the ocelli and eyes testaceous; rostrum with the second joint rather longer and distinctly paler than the first, which is unicolorous with the head, apical joint testaceous; antennæ black with the apical half of the third and the fourth joint fuscous; first joint about two-thirds the width of the vertex between the eyes, length of joints 5·7, 2·14, 1·87, and 2·0 mm. Pronotum dull purple-black with the posterior lateral margins of the posterior lobe tinged with testaceous; lateral marginal carina rather less distinct than in *A. ornatulum*, Bredd., particularly on the anterior lobe, which is also less prominent and less distinctly sculptured. Pro-, meso-, and metasterna black, slightly shining. Scutellum dull purple-black with the apical spine shining. Hemelytra dull purple-black with the costal margin at the base obscurely orange-yellow, and the apical third of the corium (except the extreme apex) bright orange-red; membrane entirely dull black. Connexivum (extending broadly beyond the margins of hemelytra), dorsum, and venter bright orange-red, the dorsum towards the apex black, the venter with the pygofer shining black and a large black area on the disc of the sixth apparent ventrite, extending divergent bands on to the fifth and fourth apparent ventrites. Legs purple-black, clothed along their lower surfaces with short golden-brown hairs interspersed (particularly on the hind legs) with longer ones; anterior and intermediate tibiæ provided with small spongy fossæ, tarsi slender, pale fuscous.

Length 11 mm., breadth across humeral angles 3 mm.

♀. Similar to ♂, but with the black on the disc of the venter extending over the apical two-thirds and with the long hairs of the hind legs absent.

There is a variety of the ♂ in which the red area of the hemelytra extends along the costal margin to its base, so that only the inner angle of the corium (between the clavus and the membrane) and its extreme apex remains dark.

2 ♂ ♂, 1 ♀, Victoria, Loutit Bay (*G. F. Hill*).

Easily distinguished from *A. ornatulum*, Bredd., by the brighter red colour, the entirely black membrane, the differently coloured venter, and by the dull surface of the head and pronotum, etc.

LIV.—*Descriptions and Records of Bees.*—CIV.

By T. D. A. Cockerell, University of Colorado.

Anthophora subrussata, sp. n.

♀ (type).—Length nearly 17 mm.

Very robust, black, the pubescence mainly pale ferruginous; eyes black or nearly; labrum (except margin and obscure basal spots), base of mandibles broadly, lower corners and reversed T on clypeus (the stem slender), broadly triangular supraclypeal mark, fusiform lateral marks along border of clypeus (not reaching orbits), all pale reddish yellow; scape black; flagellum dusky ferruginous beneath beyond second joint; hair of head light reddish (copper-red on labrum), nearly white on cheeks beneath, on vertex, face and front strongly mixed with black; mesothorax with thin short pale reddish hair, and longer black hairs intermixed; thorax posteriorly and at sides with long pale red hair; tegulæ dull ferruginous. Wings rather short, dilute fuliginous, with black nervures. Legs black (a little red on anterior and middle knees); tibiæ and tarsi with orange-ferruginous hair on outer side, very dark brown or reddish on inner, practically black on inner side of hind tibiæ, but on inner side of their basitarsi deep ferruginous. Abdomen very minutely punctured; hind margins of first three segments with light ferruginous hair-bands, on first two much narrowed, on third emarginate, in middle; fourth segment with an interrupted band, paler than the others; fifth ventral segment fringed with red hair (*Baker*, 28121).

♂.—Smaller and less robust, as usual; lateral marks filling space between clypeus and eye, up to a short distance from top of clypeus; scape with a light band in front; hair on inner side of basitarsi rich red; fifth abdominal segments with a little red hair at sides posteriorly.

In both sexes the maxillary blade and tongue are very long.

Samar, Philippine Is., received from C. F. Baker.

Unlike any previously known Philippine species.

The following key separates it from several related forms:—

Hair of thorax above bright red, not mixed with black. (Penang.)	*himalayensis*, Rad.
Hair of thorax above mixed with black	1.
1. Second and third abdominal torgites covered with red hair. (Singapore.)	*insularis*, Smith.
Second and third segments with broad or narrow bands	2.
2. Band on second segment reduced to a line except at sides; hind basitarsi with black hair. (Formosa.)	*urens*, Ckll.
Band on segment not reduced to a line, or, if quite slender, hair of hind basitarsi not black	3.
3. Hind basitarsi with black hair; all abdominal hair-bands of same colour. (Bangalore.)	*subinsularis* (Strand).
Hind basitarsi with red hair; last abdominal band paler than the others	*subrussata*, Ckll.

Eucera sociabilis, Smith.

Males. Kiushiu, Japan (*C. F. Baker*, 23122).

Megachile albobarbata, Cockerell.

Surigao, Mindanao (*Baker*, 23129). Larger than type, but otherwise identical.

Megachile metallescens, Cockerell.

Dapitan, Mindanao (*Baker*, 23131).

Megachile bakeri, Cockerell.

Dapitan, Mindanao (*Baker*, 23130). Two; smaller than type, but otherwise the same.

Megachile mcgregori, Cockerell.

Males. Dapitan, Mindanao (*Baker*, 23132). Differing from the type by the fulvous tint of the abdominal bands.

Megachile labascens, sp. n.

♀.—Length about 14 mm.

Robust, black, including legs; flagellum beneath, and tegulæ, very obscurely reddish. Wings dusky, nervures fuscous; mandibles broad, with a strong apical tooth and a long inner cutting-edge; clypeus finely and densely punctured, but strongly glistening in middle, the lower margin with a broad rounded median excavation; supraclypeal area highly polished, flattened, finely punctured. Sides of face, region between antennæ, and cheeks with white hair; vertex and front with black hair, and thin black hair on clypeus and at each side of face at level of supraclypeal area; mesothorax shining but closely punctured, scutellum dull; tubercles with a conspicuous tuft of white hair; thorax above and at sides with hair nearly all black; but some pale just above tegulæ, white hind edge of scutellum, and all of postscutellum and metathorax have creamy-white hair; tarsi reddish apically; hind basitarsi broad and shining; hair of legs mainly short and black, but a band of silver-white hair on inner side of anterior tibiæ, inner face of hind femora with short silvery pubescence, inner face of hind tibiæ and tarsi dark red, with reddish hair. Abdomen broad, segments 1 to 5 with rather broad dense apical fulvous hair-bands, 2 to 4 also with less evident subbasal bands, interrupted on 4; between the bands is short black hair, and the apical segment has black hair; ventral scopa very pale fulvous, black at sides of third and fourth segments, and black on fifth and sixth.

Mt. Makiling, Luzon (*C. F. Baker*, 1435).

Quite unlike any female known from the Philippine Islands, but possibly the female of *M. structilis*, Ckll. I describe it as distinct, as there is no way to definitely link it with *M. structilis* at the present time.

Sphecodes sibuyanensis, sp. n.

♂.—Length about 9 mm.

Rather robust, black, the first three abdominal segments dark chestnut-red, the first with a variable dorsal black patch. Wings fuliginous, paler at base; first recurrent nervure joining second cubital cell about its middle. Head broad, face with white hair; flagellum thick, moniliform; cheeks with silvery hair. Mesothorax and scutellum with very large punctures, but the intervals shining; area of metathorax with strong obtuse irregular rugæ; mesopleura very strongly and densely punctured; tibiæ with shining greyish-white hair. Abdomen shining, finely punctured.

Two from Sibuyan Island, Philippines (*Baker*, 23128).

Among the Philippine species falling nearest to *S. latifrons*, Ckll., but much larger, and the face not so broad. It is the first bee from Sibuyan Island.

Sphecodes rotundiceps, Cockerell.

♀.—Dapitan, Mindanao (*Baker*, 23124).

The head is distinctly broader than in the type from Luzon, and it is possible that the Mindanao insect is racially distinct. The first recurrent nervure joins the second cubital cell very near the end.

Trigona dapitanensis, sp. n.

Worker. A small species like *T. biroi*, Friese, *T. læviceps*, Smith, and *T. iridipennis*, Smith. It might be taken for *T. biroi*, but for the fact that the hair on margin of scutellum is very pale fulvous, not at all black, and the labrum and mandibles are clear ferruginous. The clypeus is slightly reddish, the apical margin not paler. From *T. læviceps* it is known by the reddish-black (not ferruginous) abdomen; from *T. iridipennis* by the light hair of margin of scutellum and dark abdomen. Face broad; scape, first two joints of flagellum, and the others beneath, clear ferruginous; front, vertex, mesothorax, and scutellum highly polished; tegulæ very dark reddish; wings smoky; stigma ferruginous with a dark margin; sides of thorax with greyish-white tomentum; small joints of tarsi red; abdomen broad.

Dapitan, Mindanao (*Baker*, 23119).

The type-locality of *T. læviceps* must be considered Malacca. In the Wilson Saunders collection at Oxford is supposed *T. læviceps* from the Aru Islands, with reddish-black abdomen, and, so far as my notes indicate, not appreciably different from *T. dapitanensis*. It is possible that the Dapitan and Aru insects represent only a darker insular race of *T. læviceps*.

Trigona itama, Cockerell.

Worker. Sandakan, Borneo (*Baker*, 23120).

Wings considerably redder than in the type from Singapore. It is a much less bulky insect than *T. busara*, Ckll., also found at Sandakan. The scutellum of *T. busara* is much more produced than that of *T. itama*.

Nomioides valdezi samarensis, subsp. n.

♀.—Abdomen with four yellow bands; the first (on second segment) interrupted and forming two very large cuneiform marks; the other three narrowed in middle, but entire. Tubercles, upper edge of prothorax, scutellum, and post-scutellum yellow.

Samar, Philippine Is. (*Baker*, 23127).

The abdominal banding allies it with *N. dapitanellus*, Ckll., but the slighter build and shining blue-green mesothorax show that it belongs with *N. valdezi*.

Hylæus opacissimus (Cockerell).

Cuernos Mts., Negros (*Baker*, 23123).

Previously known from Luzon and Mindanao, and also from Borneo.

Euryglossina chalcosoma, Cockerell.

Both sexes from Botany Bay, N.S.W. (*H. Petersen*; *Baker*, 23125, 23126).

Triepeolus fazi, sp. n.

♂.—Length about 9·4 mm.

Black, with the usual light markings; mandibles red, except at extreme base and apex; scape moderately thick, black, with a small red spot at base; flagellum bright ferruginous, suffusedly dusky above; eyes pale green; clypeus very densely punctured; appressed hair of face sordid white, shining. Mesothorax very densely punctured, the anterior middle with a pair of large round yellowish-tinted hair-patches, from whence proceeds backward a very broad cuneiform band of thin pubescence; posterior corners of metathorax with round hair-spots, connected with narrow band along posterior margin; mesopleura densely punctured, thinly hairy; sides of metathorax with white hair; tegulæ clear apricot-colour. Wings slightly dusky, stigma red, nervures fuscous; coxæ, trochanters, and femora black, but knees, tibiæ, tarsi, and spurs clear red. Abdomen with six pale ochreous tinted hair-bands, the first greatly broadened at sides, but not enclosing an area; second broadened at sides, with a shadowy anterior lobe at extreme sides; hind margins of segments 3 to 6 narrowly fulvous; apical plate black, broad and rounded.

Central Chile (*Alfredo Faz*).

Sent mixed with *T. gayi* (Spinola), from which it is easily known by the mesothoracic pattern, that of *T. gayi* consisting of a pair of separated, sharply defined, ochreous spots anteriorly, with no posterior extension. I follow the traditional interpretation of *T. gayi* with some misgiving. Smith, following Spinola, says the first and second joints of antennæ are red, which does not agree with the species before me, that having the scape black, with red spot at base, the flagellum entirely red beneath, and above at base. Smith also says "legs reddish beneath," but Spinola's "pedum parte inferiore rubello" probably means that the tibiæ and tarsi are red, as in my specimens. Smith also says "margins of the segments having bands of pale pubescence," but Spinola has "abdominis lateribus pilis raris." I found a specimen labelled *T. gayi* in the British Museum, and noted that it was a *Triepeolus* much like *T. flavofasciatus* (Smith). I also noted that *Epeolus gigas*, Spinola, was to be called *Triepeolus gigas,* and was a species about the size of *T. tepanecus* (Cresson). The U.S. National Museum also has specimens determined as *T. gigas* and *T. gayi*, the latter from Friese. My specimens of supposed *T. gayi* (both sexes) run exactly to that species in Friese's table. In the Hope collection at Oxford I found a specimen of *Epeolus gigas*, and noted that the scape was greatly swollen.

Apis indica japonica (Rad.).

Worker. Tsuruga, Japan, June (*Cockerell*).

The specimen is unusually robust, with broad abdomen, and looks very much like *A. mellifera lamarckii*, Ckll. (specimen from F. Smith's collection compared), but is separable by the yellow labrum, basal nervure not so distant from nervulus, first intercubitus with a strong double curve, and yellow at base of second abdominal segment much narrower than the black beyond.

Apis mellifera, L.

Typical form, with black abdomen. Kongaus, August (*Cockerell*); Tutihe, July (*W. P. Cockerell*); Olga, July (*Cockerell*); Barhatnaye (*Lavrushin*); all in Siberia.

Apis mellifera carnica (Pollm.).

Valentine Bay, July 12 (*Cockerell*); Kudia River, July (*Cockerell*); both in Siberia.

Halictus carinatus (Cameron).

The type of *Ctenonomia carinata*, Cameron, from Borneo, in the British Museum, is a black *Halictus* with entirely dull mesothorax and scutellum; area of metathorax very large, with fine parallel lines; posterior truncation sharply defined all round; hind spur pectinate with sharp teeth; wings dusky, outer nervures distinct, second s.m. rather short; bands of tomentum at extreme bases of abdominal segments. Placed with this in the Museum is an entirely different *Halictus*, collected by Ridley in S. Perak.

Halictus lucidipennis, Smith.

Described from N. India, in the Baly collection.

In the British Museum I found two different species under this name, neither agreeing with the original description. One, from Simla (Cameron collection), has thorax with fulvous hair above, stigma amber-colour, abdomen brassy-green. The other, from Ceylon (*Thwaites*), is brassy-green, but much smaller, abdomen polished, without hair-bands, stigma dark reddish fuscous, outer t.-c. and r. n. hardly visible.

Nomia torrida (Smith).

India.

The type, in British Museum, is a *Nomia*, though described as *Andrena torrida*. No facial foveæ; wings fuliginous, hyaline at base; marginal cell broadly subtruncate.

Andrena partita, Walker.

Egypt.

♀.—Type in British Museum.

Large head; clypeus finely punctured, with raised median line; facial foveæ broad, brown above, white below; mesothorax with fine punctures on shining ground; tegulæ dark ferruginous; stigma red; second cubital cell broad, receiving first r. n. distinctly beyond middle; abdomen red basally.

Paracolletes cristatus (Smith).

When reporting on Smith's Australian *Paracolletes* in 1905, I had not been able to see *P. cristatus* or *P. irroratus*. They are both in the W. Saunders collection at Oxford. *P. cristatus* has the scutellum and postscutellum with long bright red hair; area of metathorax with median transverse ridge, below which are transverse striæ.

Paracolletes irroratus (Smith).

A very large pyriform patch of red tomentum at each side of mesothorax, going back to level of hind edge of tegulæ; eyes purplish red.

Dioxys brevipennis (Cameron).

Cameron's *Aglaoapis brevipennis* (type in Rothney collection at Oxford) is a *Dioxys*, as Meade-Waldo has stated.

Length about 6·4 mm.

Wings reach end of third abdominal segment; postscutellar prominence very small; basal nervure going basad of nervulus; first three abdominal segments red (vertical base of first black), the second segment brighter than the others; end of abdomen notched.

LV.—*Experimental Acclimatisation of* Sabinea ulvæ (*Pennant*) *to Fresh-water*. By A. E. Ellis.

In order to test the adaptability of *Sabinea ulvæ* (Pennant) [= *Paludestrina stagnalis*, Kennard & B. B. Woodward] to water of lower degrees of salinity than sea-water, a number of specimens were collected in August 1924 at Morston salt-marshes, Norfolk, where the species lives in abundance in association with *Littorivaga rudis* and *Carcinus*, and were transferred to the Department of Zoology at the Oxford University Museum. Until September 26th, 1924, the molluscs were kept at room-temperature (c. 60° F.) in Channel sea-water from Plymouth (M. B. A.). The experiments were started on September 26th. It was found in the preliminary tests that the animals were apparently unaffected by a direct transference from sea-water to a mixture of equal parts of sea- and fresh-water, but when placed directly from sea-water into a mixture of one part of sea-water to two of fresh they withdrew into their shells, and became dormant after about a day—reviving, however, when replaced in sea-water.

On October 6th, 78 specimens, which had been for about a week in equal parts of fresh- and sea-water, were transferred to 55 per cent. fresh-water at 60° F. in an earthenware pie-dish (it had been previously found that the molluscs persistently crawled out of glass dishes, possibly being irritated by the light from the sides of the vessel; in a pie-dish they showed much less tendency to leave the water). The animals were fed on *Ulva lactuca*. On October 10th, they were transferred to 60 per cent. fresh-water at greenhouse temperature (81° F., but subsequently averaging 76° F.), and at the same time 25 specimens were removed from the stock in sea-water and placed in 50 per cent. fresh-water at room-temperature (65° F., later sinking to 54°). These latter were transferred to 55 per cent. fresh-water on October 17th, then to 60 per cent. on October 24th, 65 per cent. on October 29th, and 70 per cent. on November 4th. On November 21st a few were still active, but most were withdrawn into their shells. On being placed in 75 per cent. fresh-water all the animals soon became inactive, but remained alive.

The specimens in the greenhouse (76° F.–68° F.) were changed to 65 per cent. fresh-water on October 24th, 70 per cent. on October 27th, 75 per cent. on October 29th, 80 per cent. on November 1st; on November 4th all the animals were found to have closed up, and were replaced in 75 per cent. when they revived. On November 11th they were again inactive, but crawled actively when placed over hot-water pipes (77° F.); they were kept at this warmer temperature, and transferred to 80 per cent. fresh-water on November 21st, and then to 85 per cent. on December 1st; on December 4th most of the snails were torpid, but a few had enough energy to crawl out of the water. On December 6th the animals were placed in 90 per cent. fresh-water in an incubator (86°·5 F.), but after a week became inactive, and by the end of the year all were dead. The *Ulva*, however, was still green on January 17th, 1925, so the food-plant would seem more adaptable than the snails.

The stock in sea-water was kept in the greenhouse (c. 76° F.) from October 24th, and remained in a healthy condition.

These experiments show that temperature has a marked effect on the acclimatisation of a Mollusc to water of decreasing salinity, higher temperatures being decidedly favourable; for, whereas at ordinary room-temperature *Sabinea ulvæ* failed to tolerate water containing less than 25 per cent. sea-water at c. 76° F., the species survived in a mixture of 17 parts fresh to 3 parts sea-water.

St. Edmund Hall, Oxford.

LVI.—*Descriptions of new Species of Marine Fishes from S. Africa.* By K. H. Barnard, D.Sc., F.L.S., F.R.S.S.Afr.

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In the 'Annals of the South African Museum,' vol. xiii. pt. 8 (1923), I published descriptions of ten new species of S. African fishes. By an unfortunate oversight, a preoccupied name was used for a species of *Ophichthys*: instead of *triserialis*, preocc. Kaup, I now suggest *algoensis*, nom. nov.

In the present paper descriptions of ten new species are given. These specimens are partly from the collections of the former survey vessel S.S. 'Pieter Faure,' partly from other collections in the South African Museum, where all the types are preserved.

Hemirhamphus (*Hyporhamphus*) *delagoæ*, sp. n.

Body slightly compressed. Length of head 2½, length of lower jaw 4¾, in length of body. Eye ⅔ interorbital width or postorbital part of head. Triangular part of upper jaw as broad as long, scaly. Length of preorbital ½ diameter of eye. D. 14. A. 14. Dorsal a little longer than, and arising at about same level as, anal, both scaly in their anterior parts. Pelvic fins midway between base of caudal and eye. Middle rays of caudal longer than eye. Scales 50. Air-bladder simple. Up to 300 mm.

Delagoa Bay (*K. H. B.*, 1912).

Allied to *H. unifasciatus* (incl. *neglectus*), *melanurus*, and *balinensis*. It may be the same as the species recorded from Kosi Bay by Regan as *H. dussumieri*, but it certainly does not correspond with any of the descriptions of that species.

Notopogon macrosolen, sp. n.

Distance from base of second dorsal spine to vent 1⅓–1½ in that from head to caudal fin. Length of head twice in length of body. Snout 2⅓–2½ times length of rest of head. Eye subequal to (or a trifle less than) postorbital part of head, 5 in length of snout. D. VII. 15. A. 18. Second dorsal spine strong, serrated, its length 2⅓–2⅔ in distance from operculum to candal; inserted above middle or posterior third of anal. Dorsal profile evenly convex, with a very slight concavity in which the patch of very short (and inconspicuous) bristles is situate. Up to 280 mm.

Colour very pale rose-pink with a silvery lustre; fins transparent, with two rose-pink cross-bands on caudal, two on dorsal, and one on anal.

Off Table Bay, 200 fathoms (*K. H. B.*, 1922).

This splendid species is easily distinguished from *N. hillici*, and, indeed, from all other species of the genus, by the great length of the snout. It appears to be not uncommon in the deeper waters to the N.W. of Table Bay, being obtained by fishing-vessels when trawling for Stock-fish.

Antimora australis, sp. n.

? 1924. Gilchrist and von Bonde, Fish. Mar. Surv. Spec. Rep. 7, p. 13 (*viola*, non G. & B.).

Depth 5½–6, length of head 3¾–4½ in length of body. Length of head much more than half distance between bases of ventrals and anal. Caudal peduncle slender, its depth 2½ in its length. Eye 3¾–4 in length of head, subequal to interorbital width and slightly less than length of snout. Maxilla not extending quite to below posterior margin of eye. Barbel 2½ in diameter of eye. 10 gill-rakers on lower part of anterior arch. D. 4, 50–54, first ray of first dorsal ¾ length of head. A. 38–40. V. 6, second ray twice as long as first, slightly longer than first dorsal ray, ca. ⅓ length of head. Scales l. l. about 130 (but impossible to count accurately), l. tr. ca. 10 between dorsal fin and lateral line. Pyloric cæca 11–12. Vent nearer to operculum than to base of caudal fin. Up to 280 mm.

Colour (as preserved) brownish, more or less violaceous, especially on the abdomen and gill-covers, branchial chamber brownish black.

Off Cape Point, 475–900 fathoms.

This form does not seem to fit any of the described species of this genus. The combination of characters comprising the length of the first dorsal ray, number of gill-rakers and pyloric cæca, and slenderness of body, justifies its separation. The species are all very closely allied. The present one is perhaps nearest to the N. Atlantic *viola* (G. & B.), the descriptions of which, however, as given by Goode and Bean, Günther, Jordan, and Evermann are not consistent.

This is probably the form referred to by Gilchrist and von Bonde as *viola* (G. & B.).

Bathygadus fumosus, sp. n.

Depth 6⅓–6¾, length of head 5⅔–6¼ in length of body. Orbit (not the eye) equal to snout or to interorbital width, 4½–4¾ in length of head. Maxilla extending beyond vertical of hind margin of orbit by about ⅓ diameter of orbit. Teeth minute (not separable without a lens). Barbel small but distinct, ⅓–⅔ diameter of eye. Gill-rakers 27–28 on lower part of anterior arch. First dorsal of 11 rays; second ray twice as long as head. P. 16–17, second ray 2⅓ times length of head. V. 8, first ray twice length of head. Scales 6 between dorsal and lateral line. Shoulder-girdle scaly beneath the membranous flap of the operculum. Pyloric cæca 18–20. Up to 460 mm.

Colour (as preserved) greyish, silvery on the head and abdominal regions, mouth and branchial cavity blackish-brown.

Off Cape Point, 480–810 fathoms.

The name is a MSS. name given by Boulenger, to whom a specimen was sent by Gilchrist.

This species combines the short barbel of *Bathygadus* with the minute teeth of *Gadomus*. It has the orbit equal to the interorbital width, and thus belongs to the *Melanobranchus* group, being closely allied to *B. micronema*, Gilb. It also shows affinities to *Gadomus multifilis* (Günth.) and *G. introniger*, G. & B., but is distinct from all in the number of gill-rakers and pyloric cæca, and associated characters.

Coryphænoides (*Chalinura*) *striatura*, sp. n.[*].

Depth about equal to length of head, 5½–6 in length of body. Eye 1¼–1⅓ in interorbital, 1⅓–1½ in snout, 5–5¼ in length of head. Snout short, obtusely conical. Under side of head (including rami of lower jaw) scaly. Maxilla extending to below hind margin of eye. Teeth in a band in upper jaw, outer series enlarged, considerably larger than the (6–8) inner series, in a single moderately enlarged series in lower jaw. Barbel subequal to eye. Gill-rakers 10–11. First dorsal of 11 rays; second ray 1¾–1⅘ length of head, closely serrate in its entire length. A. ca. 110. P. 19–21, equal to postorbital length of head. V. 12, outermost ray filiform, twice as long as any of the other rays, ¾ length of head. 12–14 sub-parallel or slightly diverging rows of small spinules on each scale; 6 scales between first dorsal and lateral line. Distance from vent to isthmus equal to length of head. No scaleless fossa. Pyloric cæca 9–11. Up to 510 mm.

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[*] *striatura*, the fluting on a column.

Colour (as preserved) brownish, fins and gill-membranes blackish.

Off Cape Point, 450–950 fathoms.

This species seems close to *C. leptolepis*, Günth. (Brazilian coast), but differs in the larger eye, more numerous flutings on scales, presence of scales on lower side of head, and greater number of ventral rays. This last feature seems to differentiate it from all other species of the genus.

Cœlorhynchus (*Oxygadus*) *braueri*, sp. n.

1904. Gilchrist, Mar. Invest. S. Afr. iii. p. 137 (egg), as *Macrurus parallelus*, non Gunth.
1906. Brauer, Wiss. Ergebn D. Tiefsee Exp. xv. 1, p 257 (*parallelus*, non Gunth.).

Depth 7–8, length of head 3½–4 in length of body. Depth of body usually ½ length of head, or a little more. Snout conically produced, depressed, dorsal profile concave, margins nearly straight, slightly concave before the sharply pointed apex, length 2⅓ in length of head. Distance between isthmus and symphysis of lower jaw a little shorter than distance between point of snout and margin of upper jaw. Interorbital width ⅔ longitudinal diameter of eye, which is 1½ in snout and 3½ in length of head. Lower surface of head scaly. Barbel ⅓ diameter of eye. Gill-rakers 6 (7). Teeth in villiform bands. Suboperculum with a narrow acutely pointed flap. First dorsal of 10 rays; second ray slender, apically filiform, 1¼ in length of head. Interdorsal space 1½–2 times length of first dorsal. A. ca. 100. P. 18, almost equal to length of snout. V. 7, about as long as pectoral. 5–9 subparallel rows of spinules on each scale, the middle row on a strong keel; scales on ridges on head with the spinules more or less stellate in arrangement, the median row becoming predominant posteriorly; 5 scales between first dorsal and lateral line. Distance from vent to isthmus about equal to distance from anterior margin of eye to hind margin of operculum. A narrow longitudinal scaleless fossa from vent halfway to base of ventrals. Pyloric cæca 8–9. Up to 400 mm.

Colour (as preserved) brownish; gill-membranes and fins dusky; second dorsal ray, outermost ray of ventral and upper two to three rays of pectoral light.

West coast, off Saldanha Bay and Table Bay, off Cape Point and East London, 250–450 fathoms.

Distribution: S.W. coast of Africa (25° 25′ S., 6° 12′ E.), 500 fathoms ('Valdivia'). The distribution is probably continuous between this locality and the localities off Saldanha Bay.

The reasons for considering this a new species are as follows:—It agrees in the number of rows of spinules on the scales with the form recorded by Brauer from the S.W. coast of Africa, and also with the form from the Kermadecs named *C. kermadecus* by Jordan and Gilbert, 1904. It differs from Günther's description of *C. parallelus* in the eye being greater than interorbital width and in the number of pyloric cæca and of pectoral rays. On the other hand, it agrees with the measurements of Japanese and Philippine specimens of *C. parallelus* given by Gilbert and Hubbs as regards the eye and interorbital width, but not the interdorsal space.

In view of this conflict and the constancy of the characters given above for the S. African specimens, and the fact that, as Gilbert and Hubbs remark, several species have been confused under the name *C. parallelus*, it seems better to introduce a new name for the form hitherto recorded in the S. African fauna-list as *C. parallelus*. I associate with it the name of Brauer, who first gave a brief description of specimens caught just outside our area.

Cœlorhynchus acanthiger, sp. n.

Depth 7, length of head 3½ in length of body. Snout conically produced, not depressed, its dorsal profile straight not concave, margins gently convex right up to the acute apex, length nearly 2½ in length of head. Distance between isthmus and symphysis of lower jaw equal to distance from tip of snout to margin of upper jaw. Interorbital width equal to (slightly less in a small specimen) longitudinal diameter of eye, which is 1⅓ in length of snout and 3½ in length of head. Lower surface of head scaly. Barbel 3½–4 in diameter of eye. Gill-rakers 6. Teeth in villiform bands. Suboperculum with a pointed (but not very narrow and acute) flap. First dorsal of 9–10 rays; second ray slender, 2 in length of head (it seems to be complete). Interdorsal space twice (or a little less) length of base of first dorsal. A. ca. 90. P. 18; ⅓ length of head. V. 7, outer ray equal to pectoral and reaching to vent. Each scale with 5 (in some scales 6 or 7) subparallel rows of spinules on each side of a middle row on a strong keel; scales on the sub- and supraorbital ridges with a strong median ridge, bearing strong spinules, with or without a flanking ridge on either side; 5 scales between first dorsal and lateral line.

Distance from vent to isthmus equal to distance from anterior margin of eye to hind margin of operculum. No scaleless fossa. Pyloric cæca 11. Up to 400 mm.

Colour brown, fins and gill-membranes blackish.

Off Cape Point, 460 fathoms.

This species is closely allied to *C. spinifer*, G. & H., but distinguished by the shorter snout, greater interdorsal space, fewer dorsal rays, and more numerous rows of spinules on the scales. The ridges on the head appear to be as strongly spinose as in *C. spinifer.*

Lionurus leonis, sp. n.

Body not very abruptly narrowed behind first dorsal and base of anal. Depth about 7, length of head about 6, in length of body (tip of tail lost). Depth 1⅓ in length of head. Eye (not orbit) subequal to snout and to interorbital width, 3½ in length of head. Snout blunt, lower surface scaly. Length of upper jaw 3½ in length of head. Barbel ¾ diameter of eye. Mandibular teeth in a band slightly broader than the band in upper jaw, the outer teeth of which are slightly enlarged. Gill-rakers 8. First dorsal of 10 rays; second ray ⅘ length of head, with 16–18 serrations. P. 22–24, ⅗ length of head. V. 9, ⅗ length of head, inserted at level of first dorsal spine and behind base of pectoral. Scales: 6 rows of spinules on each scale; 12 between first dorsal and lateral line. Vent between bases of ventrals, with a small round scaleless fossa in front. Pyloric cæca 14–16. Up to (about) 300 mm.

Colour (as preserved) brownish, gill-membranes dusky.

Off Cape Point, 90–345 fathoms.

Lionurus brevibarbatus, sp. n.

Body not abruptly narrowed behind first dorsal and base of anal. Depth about 6, length of head about 5, in length of body. Eye subequal to snout, 1⅓ times interorbital width, 3½ in length of head. Snout bluntly conical. The apical tubercle of snout fairly prominent, lateral tubercles not prominent; lower surface scaleless. Length of upper jaw 3⅓ in length of head. Barbel 2½ in eye. Teeth in villiform bands, the outer row in upper jaw enlarged. Gill-rakers 9. First dorsal of 13 rays; second ray ⅝ length of head, with numerous serrations. P. 16, a little more than ½ length of head. V. 11; 2¼ in length of head, reaching to base of anal, inserted immediately beneath bases of pectoral rays and in advance of first dorsal spine. About 10 rows of spinules on each scale; 6–7 scales between base of first dorsal and lateral line. Vent midway between bases of anal and ventrals. No (separate) scaleless fossa. Pyloric cæca ca. 30. Up to 260 mm.

Colour brownish, violaceous over the abdomen; gill-membranes blackish, fins dusky.

Off Cape Point, 300–950 fathoms.

This species is very close to *L. brevirostris*, Alcock, but differs in the larger eye relatively to the snout, the absence of scales on the under side of snout, the shorter barbel, fewer pectoral rays, and shorter second dorsal ray.

It appears to be a common species at considerable depths in the vicinity of Cape Point.

Beryx longipinnis, sp. n.

Depth $2\frac{1}{5}$, length of head $3\frac{1}{3}$, in length of body. Eye $2\frac{1}{4}$–$2\frac{1}{3}$ in length of head. Interorbital width $\frac{2}{3}$ diameter of eye. A strong, horizontally projecting, backwardly curved spine on preorbital, bearing on its anterior margin a smaller accessory spine. A short sharp spine at end of nasal and one at hinder end of lower jaw. Supraorbital and interorbital ridges serrulate, each of the latter bearing a short stout spine above the anterior third of eye. Suprascapula, preopercle, and subopercle striate and serrate. Maxilla reaching to below posterior margin of pupil. D. IV. 18–19, fourth spine $\frac{2}{3}$ length of head, first ray elongate, filamentous, at least $\frac{3}{4}$ depth of body. A. IV. 27. V. I. 10, elongate, first 3 or 4 rays extending to end of caudal, following rays becoming gradually shorter. P. 15, equal to length of head. Scales striate and denticulate, but usually with a smooth median longitudinal groove: l. l. 60–62, l. tr. $\frac{10}{20}$. Up to 360 mm.

Colour silvery, with salmon- or coral-red tinge, which is deepest on back; fins pale salmon.

Off Saldanha Bay and Natal coast, 200–300 fathoms (*K. H. B.*, 1922, and *H. W. Bell-Marley*, 1923).

This species is closely allied to *B. splendens* and *B. decadactylus*, both of which are found in the Atlantic and off Japan. It is, however, at once distinguished by the spines on the snout, the elongate dorsal and ventral fins, and the structure of the scales. Compare also *Actinoberyx jugeati*, Roule, 1924.

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LVII.—*The Gryllidæ of Ceylon in the British Museum Collections.* By L. CHOPARD.

A RATHER important collection of Gryllidæ from Ceylon, mostly collected by Mr. E. E. Green, has been sent to me for study by the British Museum. This collection is composed of sixty-one species, and must very nearly include the total number of Gryllids to be found in Ceylon †. Thirteen among these species are new, but very few of them must be considered as characteristic of the fauna of the island. In fact, the fauna of Ceylon is that of peninsular India; and, if a certain number of Ceylonese species have not been recorded from the continent, most of them will very likely be found there one day or other. Yet some interesting forms seem to be characteristic of the Ceylonese fauna, especially the following ones:—*Pentacentrus pulchellus*, *Homalogryllus*, *Landreva*, *Luzuropsis*, *Arachnomimus nietneri*, *Paranaxipha*. On the other hand, this fauna looks evidently less rich than the Indian one; although certain Indian species may be found later on in Ceylon, it is very probable that the total number of Gryllids will never reach more than about one-half of the number of Indian species—this being quite in accordance with the general characteristics of insular faunæ.

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† In the following list a few species, marked with a *, are not to be found in the collection before me, but have been recorded from Ceylon.

I have also made some synonymic notes on a few species which my friend Mr. B. P. Uvarov, of the Imperial Bureau of Entomology, has had the kindness to compare with Walker's types. This comparison allowed me to rectify a few synonymies, chiefly among Nemobiinæ and Trigonidiinæ, and to complete some of Walker's descriptions.

1. *Tridactylus thoracicus*, Guér.

Peradeniya, Kandy.

2. *Tridactylus japonicus*, Haan.

= *T. riparius*, Sauss.

Sigiriya, Peradeniya, Keshewa, Pundalu-Oya.
This species is certainly Saussure's *riparius*.

3. *Tridactylus nigroæneus*, Walk.

Peradeniya, Haragam.
Extremely close to the preceding, presenting the same shape of the median tibiæ. The main difference seems to be the shape of the forehead, which is more narrow, the internal margins of the eyes being parallel in *japonicus*, while in *nigroæneus* they are somewhat converging upwards. The coloration is the same in both species, and shows all possible variations in the shape, number, and disposition of the yellow spots.

4. *Tridactylus opacus*, Walk.

Peradeniya, Nawalapitiya.
This is a very small species allied to *T. pulex*, Sauss.; it is of a dull blackish colour, with posterior femora showing a transverse yellow stripe extending to the anterior margin; antennæ rather thick, black, with eighth and ninth joints yellow; pronotum dull black, wide, a little pubescent.

5. *Gryllotalpa africana*, Beauv.

Kandy

6. *Paranemobius pictus*, Sauss.

Peradeniya.

7. *Pteronemobius heydeni tartarus*, Sauss.

= *P. gravelyi*, Chopard, 1924, Rec. Ind. Mus. xxvi. p. 183.

Yatiyantota, Matale.

After careful comparison between numerous examples of *P. tartarus* from Turkestan and *P. gravelyi* from India, I am convinced that the minute features upon which this last species was based are purely individual variations.

8. *Pteronemobius heydeni ceylonicus*, Sauss.

Two males from the British Museum Collection without precise locality.

This insect seems to be a pale variety of *P. heydeni*, Fisch.; one of the males referred to shows a speculum belonging to the second type of de Saussure, the other to the first type; both have the internal cords united up to the middle.

9. *Pteronemobius vagus*, Walk.

Peradeniya.

The male of this species differs from that of *P. tartarus* only in the larger size, but the female shows a quite different ovipositor, this being longer and straighter (length of ovipositor: *tartarus* 6·2 mm., *vagus* 8·5 mm.).

10. *Pteronemobius taprobanensis*, Walk.

= *Eneoptera lateralis*, Walk. (♂).
= *Nemobius javanus*, Sauss.

Peradeniya, Trincomalee.

11. *Pteronemobius taprobanensis infernalis*, Sauss.

Peradeniya, Hakgala, Colombo.

This is simply the micropterous condition of the preceding.

12. *Pteronemobius alboater*, Walk.

= *Nemobius histrio*, Sauss.

No exact locality.

13. *Pteronemobius csikii*, Bol.

Trincomalee; Peradeniya (at light).

This species is very similar to the preceding, of which it offers the size and the type of coloration; it differs from it in having the fourth and fifth joints of maxillary palpi testaceous, brownish at apex, the lateral lobes of pronotum partly rufo-testaceous, the posterior femora marked with brown at base; in the female the ovipositor is longer and more strongly denticulate at apex (fig. 1), and the posterior tibiæ show four internal spines, while in *albuater* there are three only.

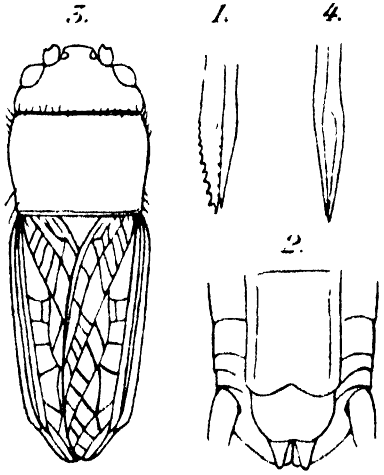


Fig. 1.—*Pteronemobius csikii*, Bol. Apex of ovipositor.
Fig. 2.—*Anurogryllus tenellus*, Walk. Ventral view of apex of abdomen of female.
Fig. 3.—*Gryllus pallipes*, sp. n. Dorsal view of female.
Fig. 4.—*Gryllus pallipes*, sp. n. Apex of ovipositor of female.

14. *Gymnogryllus humeralis*, Walk.

Kandy, Peradeniya, Chilaw.

15. *Gymnogryllus erythrocephalus*, F.

Peradeniya.

16. *Anurogryllus tenellus*, Walk.

Peradeniya, 1 ♀.

This most interesting insect has been compared by Mr. Uvarov with Walker's type, which is also a female, and which presents exactly the same features. The shape of the abdominal end shows that the species cannot be left in the genus *Gryllus*, and must be removed to *Anurogryllus*, which was known only as an American genus.

From the study of the specimen before me, I can add the following details to Walker's description :—

♀. Dark rufous-brown, head shining, pitch-brown, without any pattern; face testaceous; ocelli yellow, disposed in a triangle. Pronotum rufous-brown, marked with yellow at the anterior angle of the lateral lobes, these latter quadrangular. Abdomen brown above, yellowish beneath; eighth sternite longer than the preceding, subgenital plate small, somewhat truncate at apex. Ovipositor quite abortive, forming only a very short furcate process, scarcely exceeding the subgenital plate (fig. 2). Legs rufous, the anterior tibiæ showing an oblong external tympanum, no internal one. Posterior legs wanting. Elytra extending to the apex of abdomen, dark brown; dorsal field presenting nine little, distant, almost longitudinal veins, the first five free, the sixth from base of the discoidal, a little sinuate before the middle, the other three as branches of the discoidal vein; transverse veinlets rather distant and irregular; lateral field somewhat lighter-coloured, with four parallel veins besides the mediastinal, which is plain.

Length of body 14 mm.; length with wings 21·5 mm.; pronotum 3 mm.; elytra 8·5 mm.

17. *Acheta bimaculata*, De Geer.

Kandy, Maha, Illupalama.

18. *Gryllus confirmatus*, Walk.

= *Gryllus consobrinus*, Sauss.

Colombo, Peradeniya, Eppawela.

19. *Gryllus mitratus*, Burm.

Kandy, Diyalawa, Peradeniya.

20. *Gryllus testaceus*, Walk.

Kandy, Patalam, Peradeniya.

21. *Gryllus conspersus*, Schaum.

No exact locality.

22. *Gryllus quadristrigatus*, Sauss.

Diyatalawa, Siginiya.

23. **Gryllus supplicans*, Walk.

Recorded by Walker.

24. **Gryllus angustulus*, Walk.

Recorded by Walker.

25. *Gryllus pallipes*, sp. n.

Type. 1 ♀, Peradeniya, iii. 07.

♀ (fig. 3). Size rather small, almost black, with legs testaceous. Occiput and forehead rounded, wholly black; face a little flattened, brown. Pronotum slightly enlarged anteriorly, with both anterior and posterior margins straight. Anterior tibiæ presenting a large oval external tympanum and a very small round internal one; posterior tibiæ with five spines on each margin. Elytra extending to the apex of abdomen, presenting six rather irregular and distant veins, the fourth being a branch of the third, the fifth and sixth emerging from the discoidal very near the apex; lateral field presenting three separate veins and three branches of the mediastinal, all of them parallel and regularly distant. Wings very long. Ovipositor rather long, slender, with apical valves very narrow and acute (fig. 4).

Length of body 11 mm.; length with wings 19 mm.; pronotum 3 mm.; posterior femora 7·5 mm.; posterior tibiæ 5·5 mm.; elytra 6 mm.; ovipositor 8 mm.

26. **Gryllus berthellus*, Sauss.

= *Gryllodes berthellus*, Sauss.

Recorded from Ceylon by W. F. Kirby.

Although the absence of a tympanum at the internal face of anterior tibiæ may be of some importance, it cannot be considered as a generic character when absolutely isolated. As such is the case with the present species, I consider that it must be removed to the genus *Gryllus*.

27. *Itaropsis* (gen. nov.) *parviceps*, Walk.

Kandy, Peradeniya, Ratuapura.

I think it necessary to erect for *Gryllus parviceps* of Walker the new genus **Itaropsis**, characterized as follows:—

♂. Pronotum very much narrowed in front; head very small; elytra ample, giving to the insect the habitus of Euneopterinæ, speculum wide, apical field short, with irregular sectors; two oblique veins; lateral field high, with mediastinal vein sinuate at apex and bearing a widely separated branch; six parallel sinuate veins.

♀ unknown.

Gryllodes microcephalus, Bol., certainly belongs to this genus.

28. *Gryllodes sigillatus*, Walk.

Batticaloa, Galle.

29. **Gryllodes falconneti*, Sauss.

Recorded by W. F. Kirby.

30. *Gryllodes greeni*, sp. n.

Types. 1 ♂, 1 ♀ (*E. E. Green*, no exact locality).

Testaceous, variegated with brown as in *G. sigillatus* and showing a similar pattern. Head a little wider than the pronotum in front, with forehead flattened, sloping, brown, with a somewhat obliterated yellowish band on the vertex. Palpi pale testaceous, the fifth joint of maxillary ones a little widened at apex, a little longer than the fourth.

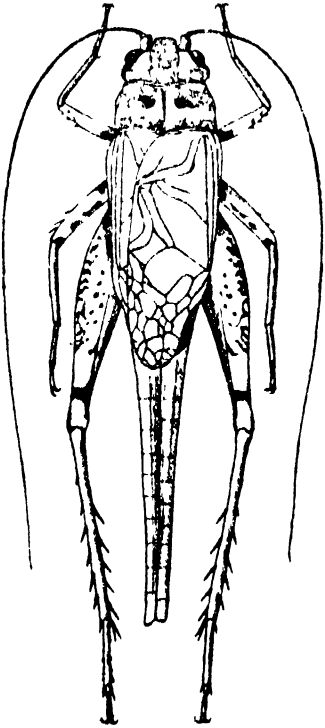
Pronotum slightly narrowing forwards, with anterior margin a little concave, posterior margin convex; lateral lobes rather strongly oblique backwards, their anterior angle somewhat projecting outwards, black, with a yellow spot in the anterior angle; disk depressed, adorned with a rather wide blackish band along the posterior margin and two large brown lateral spots; anterior margin partly darkened.

Abdomen brownish above, yellowish beneath. Cerci long.

Legs testaceous, mottled with brown. Anterior femora presenting two lateral brown spots, especially well defined on the external face; tibiæ with a rather large external tympanum; tarsi long. Intermediate femora with three brown spots at their internal face. Posterior femora spotted with brown above and presenting numerous narrow brown stripes at their external face; tibiæ armed with five internal and six external spines; supero-external spur shorter than the last spine, median spur twice as long as inferior one, medio-internal spur a little longer than superior one. Metatarsus long, with five external and four internal denticles.

♂ (fig. 5). Elytra extending to the apex of abdomen, a little narrowing towards the apex; speculum as long as wide, presenting two large posterior cells; a veinlet from the first chord to the angle of speculum; two oblique veins; apical field long, presenting a wide irregular reticulation; lateral field testaceous, translucid, with four parallel veins, somewhat diverging from the mediastinal vein, which is furcate at apex. Wings very long.

Fig. 5



Gryllodes greeni, sp. n.

♀. Elytra and wings as well developed as in male; dorsal field of elytron presenting three free veins and three branches of the discoidal, all of them almost longitudinal and regularly distant; transverse veinlets numerous towards the base of elytron only, forming on the disk and near the apex a very wide and irregular reticulation. Ovipositor long, straight, with small lanceolate apical valves.

Length of body 12 mm.; length with wings 21·5 mm.; pronotum 2·5 mm.; posterior femora 9 mm.; posterior tibiæ 8 mm.; elytra 9 mm.; ovipositor 12 mm.

Very similar to *Scapsipedus fuscoirroratus*, Bol., which should rather be placed in the genus *Gryllodes*, as it is the forehead and not the face which is a little flattened in this species. It differs from *G. greeni* in the apical field of elytra of male being almost absent and the elytra of female much shorter.

31. *Nemobiodes læviceps*, sp. n.

Type. 1 ♂ (*E. E. Green*, no exact locality).

♂. Size rather small, tawny brown, head black, shining, without any markings. Head scarcely wider than pronotum in front, occiput rounded, forehead a little sloping, frontal rostrum wide; face brown, shining; palpi light brown, the last joint of maxillary palpi equalling the fourth, slightly expanded at apex. Eyes rounded; ocelli small, yellow, disposed in a triangle.

Pronotum brownish, very pubescent, marked with yellow along the humeral edge, with anterior and posterior margins straight; lateral lobes dark brown, with inferior margin slightly ascending backwards, posterior angle marked with yellowish. Abdomen rufous-brown.

Legs concolorous, a little spotted with brown. Anterior tibiæ slightly compressed, provided at the external face only with a small oval tympanum; metatarsus short. Intermediate tibiæ and metatarsi a little longer than the anterior ones. Posterior femora rather short, marbled with brown at their external face; tibiæ armed with five spines on each margin; infero-external spur longer than the internal one, intermediate more than twice as long as the inferior, superior a little longer than the inferior, equalling the last spine; supero-internal spur a little shorter than the intermediate. Metatarsus presenting five denticles on each margin.

Elytra leaving the two last abdominal tergites free, rounded at apex; speculum very wide, with antero-internal margin very long; diagonal vein rather long, the two internal chords united at base, parallel, sending off a branch near the anterior angle of speculum and another one to the internal angle; four oblique veins; apical field very much reduced; lateral field black in its upper part, whitish inferiorly, with five rather regularly distant free veins, and the mediastinal one furcate at apex.

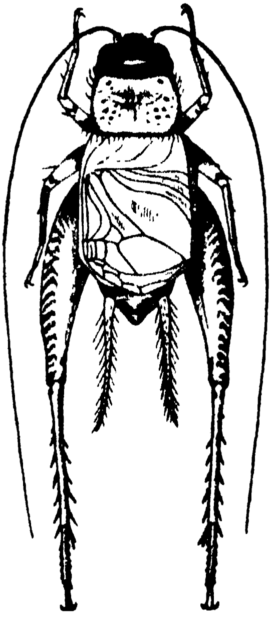
Length of body 12 mm.; pronotum 2·1 mm.; posterior femora 7·5 mm.; posterior tibiæ 4·5 mm.; elytra 6 mm.

32. *Nemobiodes nigrocephalus*, sp. n.

Type. 1 ♂, Peradeniya, vi. 05.

♂ (fig. 6). Small, tawny, with head black, shining. Head as large as pronotum in front; occiput and forehead much rounded, shining; frontal rostrum wide; face rufous-brown, shining. Palpi brown, the maxillary ones with fifth joint equalling the fourth, slightly enlarged and truncate at apex. Eyes rounded; ocelli small, yellow.

Fig. 6.



Nemobiodes nigrocephalus, sp. n.

Pronotum yellowish brown, with two large rufous impressions and a few small brown spots on the disk; anterior and posterior margins straight; lateral lobes with inferior margin almost straight, blackish, a little paler forwards, very dark and a little shining backwards. Abdomen rufous-brown.

Legs concolorous, spotted with brown. Anterior tibiæ presenting a large oval external tympanum. Posterior femora rather thick, banded with brown at their external face; tibiæ armed with five spines on each margin; apical spurs as in the preceding species; metatarsus rather long, armed with six to seven denticles on each margin.

Elytra extending to the apex of abdomen, blackish, with veins yellowish, chiefly at apex and near the internal margin; speculum transverse, with antero-external margin long; diagonal vein long, a little curved; three chords, the two external of which are much curved and approximate, sending two branches to the speculum, one to the anterior angle, another to the middle of internal margin; three oblique veins; apical field very much reduced; lateral field almost black, with four parallel veins.

Length of body 7·2 mm.; pronotum 1·6 mm.; posterior femora 5 mm.; posterior tibiæ 3·6 mm.; elytra 4·5 mm.

This species is very much like the preceding, but smaller, and its elytral venation is rather different.

These two species are somewhat different from the typical species of the genus (*N. feai*, Chop.), presenting a better-defined speculum in the male elytra. The genus *Nemobiodes* must be extended to include the small species of *Gryllodes* with rounded head and feebly shortened elytra, showing a very much reduced apical field.

33. *Cophogryllus martini*, Bol.

Sigiriya.

This interesting little species (fig. 7) has been described by Bolivar from continental India: Trichinopoly.

34. *Scapsipedus mandibularis*, Sauss.

Peradeniya.

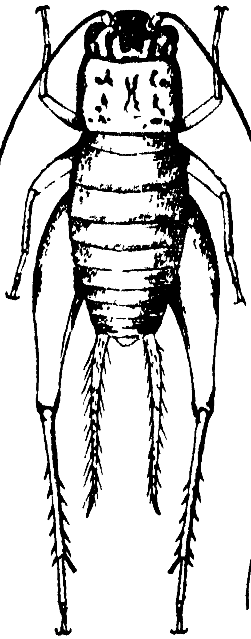
35. *Loxoblemmus equestris*, Sauss.

Peradeniya.

36. **Stephoblemmus humbertiellus*, Sauss.

Recorded from the mountains of Ceylon by Saussure.

Fig. 7.



Cophogryllus martini, Bol.

. 37. *Landreva clara*, Walk.

Peradeniya, Galla.

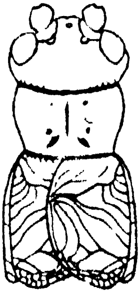
A few details may be added to Walker's short description of this species:—

Large size, rufous-brown, a little depressed, shining, but with a fine, silky, and rather abundant pubescence. Head wide, particularly in the male; frontal rostrum short, flat, finely shagreened; fifth joint of maxillary palpi triangular. Pronotum transverse, a little widened in front. Abdomen wide, a little depressed. Legs short and strong; anterior tibiæ tympanate at their external face. Posterior femora thick, darkened at apex; posterior tibiæ strong, armed with four spines on each superior margin and eight internal, ten external denticles at base; supero-external and infero-external spurs rather short, intermediate about twice as long, the superior one like the last spine; infero-internal spur shorter than the external, intermediate and superior ones long, subequal, pubescent.

♂ (fig. 8). Elytra extending to the middle of fourth abdominal tergite, rounded at apex and at the internal margin; speculum transverse, small; diagonal vein long, very obliquely directed; three chords, the two internal of which are curved, sending a branch to the speculum; seven oblique veins, among which are two long ones, separated from the other five, which are short; anal vein very sinuate; apical field very much reduced.

♀ (fig. 10). Elytra very short, lateral, presenting few straight veins. Ovipositor rather long, straight, with apical valves lanceolate, the inferior much shorter than the superior one (fig. 9).

8.



Landreva clara, Walk.

Fig. 8.—Dorsal view of male.
Fig. 9.—Apex of ovipositor of female.

Length of body 19 mm.; pronotum 3 mm.; posterior femora 12·5 mm.; posterior tibiæ 8 mm.; ovipositor 12·5 mm.

38. *Landreva subaptera*, sp. n.

Type. 1 ♀, Namunakula, 6600 feet (*E. E. Green*, 5. xi. 10).

♀ (fig. 11). Slender, ferruginous-brown, shining. Head a little wider than pronotum, with frontal rostrum short, rounded; palpi testaceous, fifth joint of maxillary palpi strongly dilated at apex.

Pronotum transverse, strongly dilated anteriorly; inferior margin of lateral lobes ascending backwards. Abdomen rather narrow and long. Cerci long. Ovipositor a little longer than the cerci, straight and slender, with apical valves lanceolate.

Legs rather strong, testaceous. Anterior tibiæ tympanate at their external face. Posterior femora moderately swollen; tibiæ armed with four spines on each margin and four denticles at base of external margin only; inferior spurs rather long, subequal; supero-external spur somewhat transferred to the superior margin and a little shorter than the last spine, intermediate spur a little longer than the inferior one; supero-internal and intermediate spurs subequal in length, rather long, the intermediate one very pubescent. Metatarsus rather long, armed with two apical spurs and four denticles on each margin.

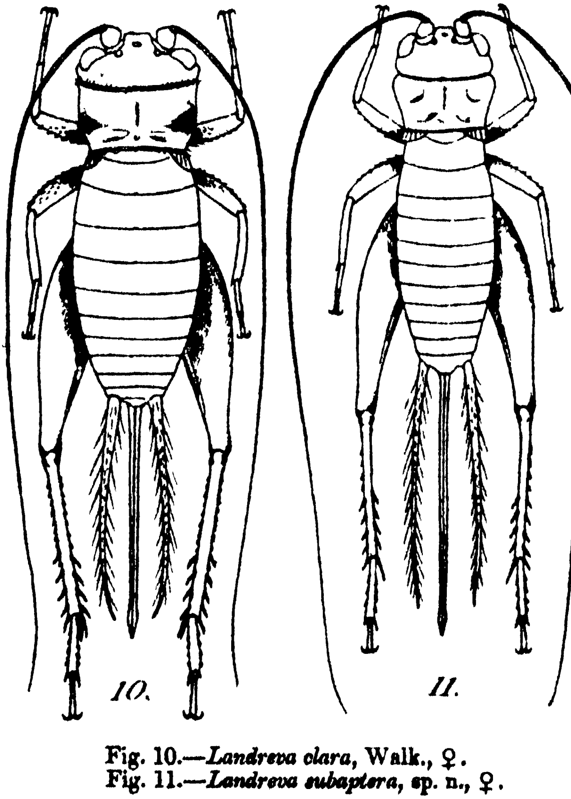


Fig. 10.—*Landreva clara*, Walk., ♀.
Fig. 11.—*Landreva subaptera*, sp. n., ♀.

Elytra very small, lateral, presenting a few straight veins.

Length of body 17 mm.; pronotum 2·5 mm.; posterior femora 10 mm.; posterior tibiæ 7 mm.; ovipositor 12 mm.

This species is very close to the preceding, but more slender and with more feebly armed posterior tibiæ. *L. hemiptera*, Bol., from India, seems still more closely allied to the present species, but is probably different, the ovipositor being much shorter.

39. *Myrmecophila dubia*, Sauss.

Peradeniya.

The only female of this species in the collection shows exactly the characters of *M. dubia* in the shape of ovipositor and armature of posterior tibiæ, but the pronotum is adorned with a dark transversal band.

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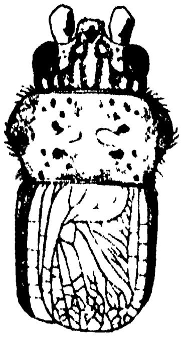

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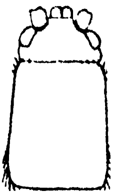

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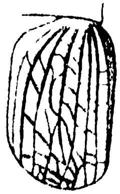

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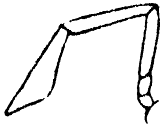

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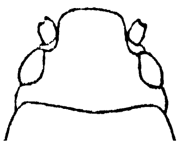


Fig. 12.—*Liphoplus ceylonicus*, sp. n. Head and pronotum of female.
Fig. 13.—*Cycloptiloides ceylonicus*, sp. n. Head of male.
Fig. 14.—Maxillary palpus of the same.
Fig. 15.—*Luzaropsis ferruginea*, Walk. Dorsal view of male.
Fig. 16.—Elytron of female of the same.
Fig. 17.—Apex of ovipositor of the same.

40. *Liphoplus ceylonicus*, sp. n.

Type. 1 ♀, Peradeniya.

♀ (fig. 12). Medium size, rufous covered with greyish scales. Head a little flattened, frontal rostrum slightly wider than the first joint of antennæ, neatly furrowed in the middle; facial protuberance projecting and almost vertically truncated. Maxillary palpi with fourth joint shorter than the third, rather strongly dilated, fifth equalling fourth in length, funnel-shaped. Antennæ testaceous, with brown rings.

Pronotum a little longer than wide, with anterior and posterior margins straight, feebly narrowing forwards; lateral lobes low, yellowish.

Abdomen rufous, almost black near the apex. Cerci very long. Ovipositor shorter than the cerci, straight, with apical valves weakly widened, the superior ones smooth, lanceolate, the inferior slightly crenulated.

Legs testaceous, with brownish scales. Anterior and intermediate femora rather thick, a little compressed; tibiæ relatively short, presenting two brownish rings, the anterior ones tympanate near the base; tarsi rather short, the metatarsus a little thick, equalling the other two articles. Posterior femora rather thick, rufo-testaceous; tibiæ much shorter than the femora, finely serrulated; apical spurs short, the intermediate of each side longer than the other two, particularly the internal one; metatarsus rather thick, denticulate.

Length of body 8 mm.; pronotum 2 mm.; posterior femora 4·5 mm.; posterior tibiæ 3 mm.; cerci 6·5 mm.; ovipositor 5 mm.

Very close to other species of the genus; characterized by its rectangular pronotum, scarcely narrowing in front, and by the ovipositor, which is denticulate at apex beneath only.

41. *Cycloptiloides ceylonicus*, sp. n.

Type. 1 ♂, Peradeniya.

♂. Small, rufous, with brown scales. Head as large as pronotum in front, a little flattened; frontal rostrum very wide (fig. 13), forming a big rounded protuberance, neither furrowed in the middle nor separated from the forehead at base. Maxillary palpi with fourth joint slender, longer than the third, fifth triangular, not very wide, and obliquely truncated at apex (fig. 14).

Pronotum very slightly narrowing in front, widely rounded posteriorly, its disk rather convex.

Abdomen rufous; tenth tergite truncated and a little notched in the middle at apex; inferior anal valves showing a process vertically erected along the superior one, not reaching up to its anterior margin. Subgenital plate very large, rounded. Cerci rather long, brown.

Legs rufous, the femora darkened at apex. Anterior tibiæ provided near the base with a small round tympanum. Posterior tibiæ a little curved, short, with yellowish apical spurs, the intermediate on each side longer than the other two, the superior ones subequal in length, the infero-internal longer than the external. Metatarsi long, rather slender, armed with scarcely visible spinules.

Elytra completely hidden by the pronotum.

Length of body 5 mm.; pronotum 2·5 mm.; posterior femora 3 mm.; posterior tibiæ 2·5 mm.

This species looks very much like *C. orientalis*, Chop., from Sumatra, but it differs from it in its rufous coloration, its legs a little longer, the frontal protuberance much more projecting, the fourth joint of maxillary palpi more slender.

42. *Luzaropsis* (gen. nov.) *ferruginea*, Walk.

Luzara? ferruginea, Walker.

Kandy.

This species has been placed by W. F. Kirby (Cat. Orth. ii. (1906) p. 89) in the subfamily Eneopterinæ, genus *Eurepa*, but the second joint of the tarsi is very small, not at all depressed, so that it must be removed to the Phalangopsinæ. I propose for it the new genus **Luzaropsis**, which is close to *Paragryllus*, Guér., but the venation of the male elytra is quite different.

The description of Walker can be completed as follows:—

♂ (fig. 15). Medium size; ferruginous-brown varied with dark brown. Head globular, rather small, narrower than the pronotum in front; occiput adorned with six brown lines, uniting two by two anteriorly, the two of these lines which are near the middle forming a pattern which extends to the frontal rostrum, the latter being as wide as the first joint of antennæ, yellow at apex; face brown, with the mouth-parts and two spots above the clypeus yellow; cheeks black. Palpi yellowish; third to fifth joints of maxillary palpi a little darkened at apex, third and fourth subequal in length, fifth very much dilated at apex, securiform. Antennæ brown with a few yellow rings. Eyes rather big, rounded; lateral ocelli round, rather large, at base of rostrum, anterior one oval, in the middle of the superior face of frontal rostrum.

Pronotum wide, particularly in front, anterior and posterior margins straight; disk rufous adorned with small brown spots; lateral lobes black, with inferior margin ascending backwards.

Abdomen rufous with a silky pubescence; tenth tergite rectangular, wide, presenting three brown spots at base. Subgenital plate rather large, rounded. Cerci long, rufous above, brown beneath.

Legs rufo-testaceous, a little mottled with brown. Anterior and intermediate tibiæ presenting three brown rings, the anterior ones provided with a small round tympanum at internal face; tarsi rather long, the metatarsus a little longer than the other joints together, ringed with brown. Posterior femora rufous-brown, without any marking, with no apical filiform part. Tibiæ armed with four spines on each superior margin, serrulate at base and between the spines, the number of denticles being 6, 3, 2, 0 on the external margin, 4, 1, 0 on the internal one; supero-internal and intermediate spurs long, infero-internal equalling the last spine; supero-external and infero-external short, equal, intermediate one about twice and a half as long. Metatarsus long, armed with two apical spurs, the internal of which is much the longer, and six external, three internal denticles.

Elytra extending to the middle of the fourth abdominal tergite, rounded at apex, with parallel margins, brown, with humeral line and veins yellowish; discoidal, anal veins and chords rather neatly marked, the rest somewhat confused, formed of about ten longitudinal or a little oblique veins, ending in a loose apical reticulation; lateral field high and short, presenting a dark brown band along the mediastinal vein, and showing four plain, parallel, feebly curved veins.

♀. Head, pronotum, and legs as in the male. Subgenital plate small, notched at apex. Ovipositor rather long, slender, with apical valves small, the superior ones strongly notched at their superior margin (fig. 17).

Elytra extending a little beyond the middle of fourth abdominal tergite, rounded at apex, with straight margins, slightly overlapping at the median line; lateral field as in the male; dorsal field with seven longitudinal, a little irregular veins, the fourth and fifth united a little before the apex, and an incomplete vein between the third and fourth; transverse veinlets moderately numerous, irregular (fig. 16).

Length of body, ♂ 14·5, ♀ 18·5 mm.; pronotum, ♂ 3·5, ♀ 4 mm.; posterior femora, ♂ 13, ♀ 15·5 mm.; elytra, ♂ 4·5, ♀ 5·5 mm.; ovipositor 13·5 mm.

43. *Arachnomimus nietneri*, Sauss.

Peradeniya.

Both sexes are absolutely similar in this species. The ovipositor of the female is long, straight, with apical valves lanceolate, smooth, acute at apex.

44. *Œcanthus indicus*, Sauss.

Trincomalee, Peradeniya.

♂ 45. *Pentacentrus pulchellus*, Sauss.

Maskeliya.

The male of this species (fig. 18) is very much like the female ; it differs from it by its very big ocelli. The venation is almost the same, each elytron presenting in the dorsal field three strong veins, but the second one is deviated at base, so that it almost touches the discoidal one ; between the second and third veins a very short incomplete vein forms a kind of basal ridge ; lateral field as in the female.

18.

19.

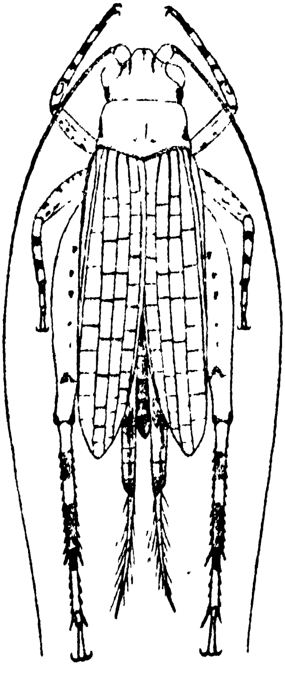
Fig. 18.—*Pentacentrus pulchellus*, Sauss., ♂.
Fig. 19.—*Homalogryllus depressus*, sp. n. Apex of posterior tibia, external face.
Fig. 20.—Internal face of the same.

46. *Homalogryllus* (gen. nov.) *depressus*, sp. n.

Type. 1 ♂, Trincomalee (*E. E. Green*, i. 1912).

♂ (fig. 21). Medium size, testaceous-brown, somewhat depressed. Head a little wider than pronotum, depressed above; frontal rostrum short, slightly sloping, as wide as first antennal joint, adorned with three small brown stripes. Face exceedingly short, triangular, yellowish, with a small λ-shaped brown figure on the frontal shield. Palpi testaceous, a little darkened at external face; maxillary palpi short, with fourth joint equalling third, a little dilated, fifth scarcely longer, forming an equilateral triangle. Eyes rather big but slightly projecting, a little lengthened antero-posteriorly; ocelli very small, the lateral ones at base of the rostrum near the eye, the anterior one near the apex, scarcely visible. Antennæ inserted very low, near the anterior angle of the eyes, brownish with a few yellowish rings, their first joint rather large, depressed.

Fig. 21.



Homalogryllus depressus, gen. et sp. n.

Pronotum flattened, wide, yellowish brown, anterior margin straight, posterior one rather strongly sinuated; lateral lobes low, a little darkened, with inferior margin ascending backwards, angles slightly rounded.

Abdomen yellowish above and laterally, blackish beneath; tenth tergite truncated; subgenital plate long, navicular. Cerci long, yellowish.

Legs short, yellowish, a little mottled with brown. Anterior femora rather dark; tibiæ presenting two rather undefined brown rings, their internal face provided with a rather small oval tympanum; tarsi moderately long, the metatarsus equalling the other two articles, ringed with brown at base. Intermediate legs similar to the anterior ones, the tibiæ a little compressed. Posterior femora rather weakly and regularly swollen, with no slender apical part. Tibiæ very short, armed at apex with two or three very small spines, and presenting in their basal part about twelve denticles; external spurs (fig. 19) short, chiefly the superior one which is spine-like, the intermediate twice as long as the inferior; two internal spurs only (fig. 20), rather long, subequal. Metatarsus rather long, compressed, armed on each margin with five or six denticles, its apical spurs very unequal; third joint slender.

Elytra rather narrow, pale brown, translucent, with the veins a little darker; lateral field black, with four longitudinal veins, the first of which is very short; dorsal field with four longitudinal parallel veins, little distant one from the other; transverse veinlets scarce, forming large, long, rather regular areolæ. Wings extending a little only beyond elytra.

Length of the body 7 mm.; length with wings 9·5 mm.; pronotum 1·5 mm.; elytra 6 mm.; posterior femora 5 mm.; posterior tibiæ 3 mm.

This species forms the type of the new genus **Homalogryllus**, which is near *Pentacentrus*, but depressed, with flattened head, pronotum wide, depressed, wings extending only a little beyond elytra. Legs as in *Pentacentrus*. Elytra of male with very straight parallel veins.

47. *Trigonidium cicindeloides*, Ramb.

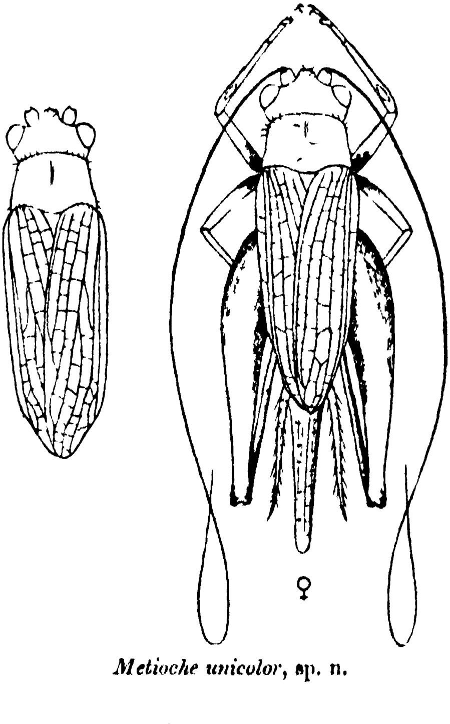
Recorded by Saussure.

48. *Trigonidium humbertianum*, Sauss.

Peradeniya, Chilow.

As it is now well established that neither the presence nor absence of a tympanum on the anterior tibiæ nor the length of the wings can be considered of generic value, it is evident that the genera *Trigonidium* and *Metioche* must be separated by some other characters than those used till now. I leave in the genus *Trigonidium* the species presenting numerous false veins between the elytral venation, with no transverse veinlets. I do not consider the oval shape of the elytra of certain species as characteristic, as it is very likely simply correlative of the apterous condition. Consequently I would be very much inclined to consider the present species as the winged condition of the widely distributed *Trigonidium cicindeloides*, Ramb.

Fig. 22.



Metioche unicolor, sp. n.

49. *Metioche unicolor*, sp. n.

Types. 1 ♂, Peradeniya (*E. E. Green*, 1. xii. 10); 1 ♀, Batavia (*H. Karny*, 22. viii. 20) * (fig. 22).

Rather narrow and long, testaceous-brown, a little pubescent. Forehead sloping, light brown, with a very inconspicuous light median line; face rufo-testaceous. Palpi light brown, a little darkened on their external face, fourth joint a little shorter than third, fifth rather short, triangular, tunnel-shaped at apex. Antennæ yellowish, with first joints not darkened. Eyes big, rounded.

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* The type-specimen of the female is in my collection.

Pronotum slightly narrowing anteriorly, with anterior margin a little convex, posterior one sinuated; disk brownish, a little lighter along the anterior and posterior margins, with a few setigerous spots near the latter; lateral lobes concolorous, with anterior angle rounded.

Abdomen testaceous-brown.

Legs concolorous, anterior and intermediate femora presenting only a very little marked brown ring near the apex; anterior tibiæ provided with a large oval tympanum either side.

♂. Elytra light brown, a little pubescent; dorsal field presenting four slightly oblique veins, the two first of which are curled, the fourth bifurcate; discoidal vein furcate quite near the base; transverse veinlets forming a somewhat irregular wide reticulation; lateral field with four parallel veins, the second of which is very short.

♀. Elytra very similar to those of the male; dorsal field presenting four longitudinal parallel veins a little sinuated at base, the fourth furcate near the apex. Ovipositor rather long, with apical valves forming not quite half the total length.

Length of body 6·5 mm.; length with wings 10·5 mm.; elytra 5 mm.; posterior femora 5 mm.; ovipositor 2·9 mm.

I have seen only macropterous specimens of this species, which has very much the general aspect and colour of *Amusurgus fulvus*, Br., but the neuration of the elytra in the male is much more like that of the female, although somewhat variable; the rather abundant pubescence is remarkable, and is also a character of *Amusurgus* rather than of *Metioche.*

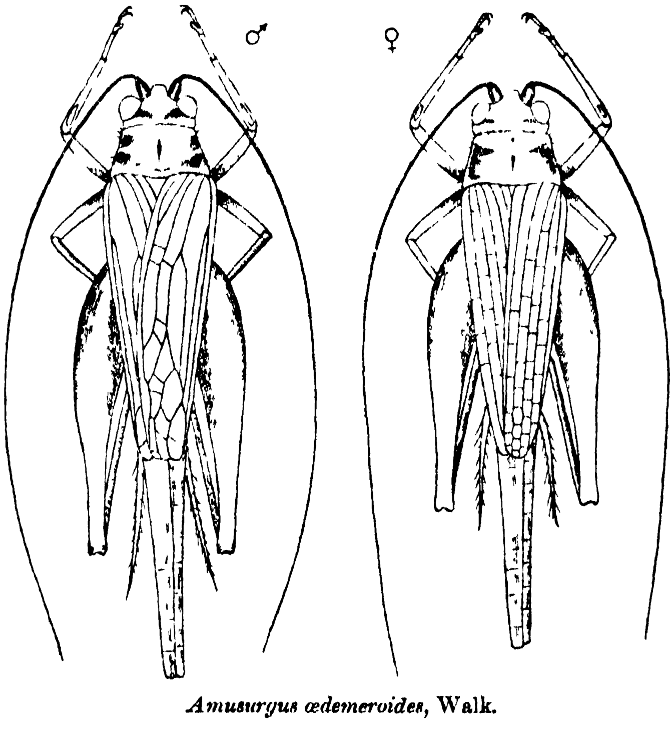
50. *Amusurgus œdemeroides*, Walk.

= *Amusurgus fulvus*, Br.

In his description of the genus *Amusurgus* Brunner states that the posterior tibiæ are armed with four spines on each superior margin. This character would be absolutely an exception among the Trigonidiinæ; I have therefore asked Professor R. Gestro to have the kindness to examine for me the type in the Genoa Museum, and the conclusion is that *Amusurgus*, as well as the other Trigonidiinæ, presents three spines only on each side of the posterior tibiæ.

I find that Walker's *Eneoptera œdemeroides* (fig. 23) presents all the features of *A. fulvus*, Br., and I do not hesitate to consider both species as synonyms. The male only shows interesting generic characters; in the female the elytral veins are five in number, quite longitudinal, equidistant, in the dorsal field; transverse veinlets are scarce except near the apex; lateral field presenting in both sexes three veins and the mediastinal, the second one being very short.

Fig. 23.



Amusurgus œdemeroides, Walk.

51. *Paranaxipha* (gen. nov.) *ornatipes*, sp. n.

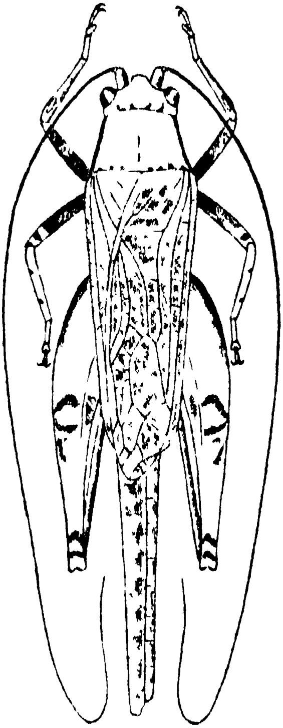
Types. 1 ♂, 1 ♀, Kandy (*E. E. Green*, vi. 1910).

♂ (fig. 24). Medium size, testaceous, varied with dark brown, rather pubescent. Head a little flattened, with round projecting eyes; face brown, shining. Maxillary palpi testaceous, with third and fourth joints mottled with brown at base, fifth wide, triangular, a little shorter than fourth. Antennæ yellowish, with first and second joints brown, and a few brownish rings.

Pronotum slightly narrowing forwards, with median line furrowed, posterior margin subangular; disk light brown, with a few small dark spots along the posterior margin and a narrow yellowish stripe on the shoulders; lateral lobes brown, with anterior angle much rounded.

Abdomen brownish. Cerci yellowish, darkened at base.

Fig. 24.



Paranauphu ornatipes, gen. et sp. n.

Genitalia in the shape of a denticulate hornlet with slightly projecting angles.

Legs pubescent. Anterior femora dark brown with whitish apex; tibiæ and tarsi yellowish, the tibiæ with a tympanum on each side. Intermediate femora brown from base to the second third, presenting before the apex a brown ring; tibiæ with two small brown spots. Posterior femora rather long and slender, testaceous, with a brown irregular stripe near the middle and a brown ring towards the apex; tibiæ presenting two small brown spots near the base, a ring about the middle and the apex of the same colour; internal spurs wholly brown, internal ones with apical half darkened; tarsi brown.

Elytra brownish, with veins a little lighter; speculum narrow, lengthened; diagonal vein almost straight, long; chords parallel, nearly straight; several veinlets between the chords and between these and the speculum; one oblique vein ending on the speculum; apical area forming large irregular cells; lateral field brown, with four veins, the first of which is a little sinuated, the other ones straight, parallel. Wings long.

♀. Same general shape and colour as the male. Elytra with dorsal field presenting four regularly distant, almost straight veins, the first one ending on the suture near the apical fourth, the third furcate at about the same place.

Ovipositor rather long, with apical valves occupying a little less than half the total length, somewhat wider in their basal part, their edges finely denticulate.

Length of body 7 mm.; length with wings 11·5 mm.; posterior femora 5 mm.; elytra 5 mm.; ovipositor 3 mm.

This species is very easy to distinguish by its coloration. The male elytra show a remarkable venation, which is the main feature of the new genus **Paranaxipha.** This genus is placed between *Amusurgus* and *Anaxipha*, the male tambourine being more differentiated than in the former, but less so than in the latter.

52. *Anaxipha longipennis*, Sauss.

Peradeniya, Yatiyantota.

This species seems very widely scattered in the Oriental Region; it is very likely the macropterous condition of *A. pusilla*, Sauss.

53. *Anaxipha pubescens*, sp. n.

Type. 1 ♂, Peradeniya (*E. E. Green*, 31. xii. 10).

♂ (fig. 25). Testaceous-brown, very pubescent. Head a little depressed; forehead slightly sloping, ending in a rostrum as wide as first antennal joint; face rufous. Palpi testaceous, the fifth joint of maxillary palpi short, triangular, the fourth a little shorter than third. Antennæ yellowish. Eyes rather big and projecting, a little lengthened.

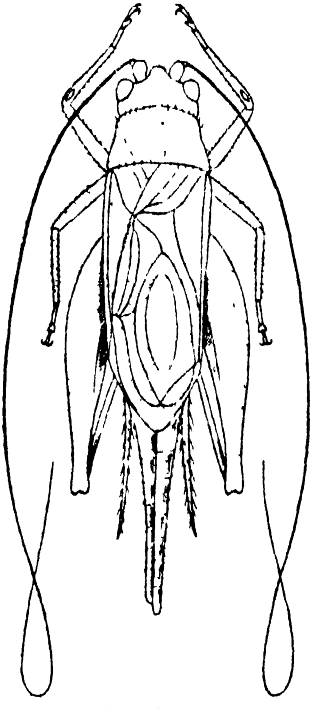
Pronotum rufous, furnished with an abundant pubescence, its anterior and posterior margins almost straight; lateral lobes with inferior margins slightly notched, anterior angle rounded.

Abdomen testaceous-brown. Cerci long, yellow.

Legs concolorous, very pubescent; anterior tibiæ provided on either side with a large oval tympanum. Posterior femora rather thick; tibiæ armed with three pairs of slender spines.

Elytra pubescent, light brown with veins yellowish. Speculum very large, occupying more than half the elytron, rather narrow; diagonal vein very short, almost straight, lateral field with three veins, one of which is straight, the other two slightly sinuated. Wings long.

Fig. 25.



Anaxipha pubescens, sp. n.

Length of body 6·5 mm.; length with wings 10 mm.; posterior femora 5 mm.; elytra 5·3 mm.

By the shape of the eyes this species is somewhat related to *Cyrtoxipha*; it is remarkable by its abundant pubescence and the very large speculum of the elytra.

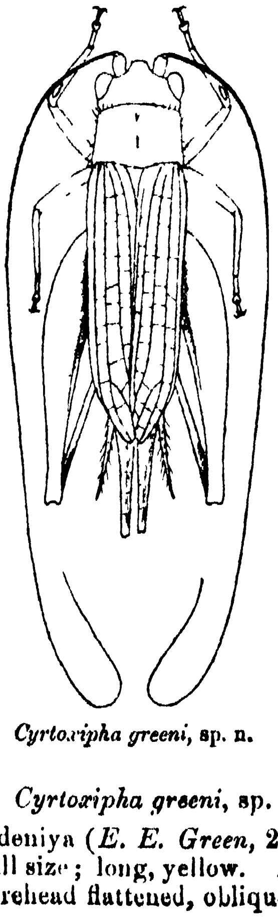
54. *Homœoxipha lycoides*, Walk.

= *Homœoxipha histrio*, Sauss. (micropterous ♀).
= *Cyrtoxipha rusemæ*, Sauss. (macropterous ♂).

Kandy, Peradeniya, Pundalu-Oya.

The inner-side tympanum of anterior tibiæ is sometimes obliterated in the micropterous condition. The difference between the genera *Anaripha* and *Homœoxipha* lies in the shape of the pronotum, which is much narrowed and rounded anteriorly in the latter, and in the venation of the female elytra, which present false veins between the principal ones.

Fig. 26.



Cyrtoxipha greeni, sp. n.

55. *Cyrtoxipha greeni*, sp. n.

Type. 1 ♀, Peradeniya (*E. E. Green*, 2. vi. 10).

♀ (fig. 26). Small size; long, yellow. Head a little wider than pronotum; forehead flattened, oblique, rostrum narrow.

Maxillary palpi with fifth joint shorter than fourth, widened and circular at apex. Antennæ yellow. Eyes lengthened, slightly projecting.

Pronotum a little wider than long, with anterior margin slightly concave, posterior one sinuated; lateral lobes with inferior margin rounded.

Abdomen yellowish brown; subgenital plate rather large, notched. Cerci yellow. Ovipositor with apical valves occupying nearly half the tótal length, the superior ones presenting two rows of five to six rather strong denticles near the apex, the inferior ones with a finely denticulated ridge from base to the apical part.

Legs concolorous, the anterior tibiæ rather strongly dilated at base and presenting on either side a large oval drum.

Elytra yellow, rather pubescent, parallel, extending almost to the apex of abdomen; dorsal field presenting five parallel veins, the three internal of which are curled on each other, the fourth furcate a little before the apex; transverse veinlets scarce and feebly visible; left elytron with internal part covered by the right one wholly transparent: lateral field presenting two short curved veins and two long straight ones almost parallel with the mediastinal vein. Wings extending very little beyond the elytra.

Length of body 6·5 mm.; length with wings 10·5 mm.; posterior femora 4·8 mm.; elytra 5·5 mm.; ovipositor 2·5 mm.

This species looks very much like *C. gundlachi*, Sauss., from Central America, type of the genus; it differs from it by the pubescence of the elytra, with less visible veins, the first of which is curled on the second farther from the apex.

*56. *Madasumma præcipua*, Walk.

Recorded by Walker.

*57. *Madasumma varipennis*, Walk.

Recorded by Walker.

58. *Madasumma marginipennis*, Guér.

Peradeniya, Wellawaya (figs. 27 *a*, 28, 30).

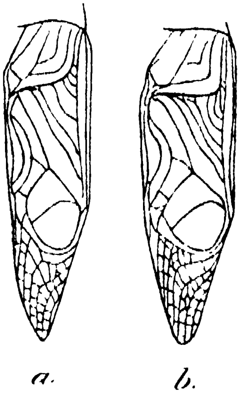
59. *Madasumma greeni*, sp. n.

Types. 1 ♂, Kandy (*E. E. Green*, v. 1910); 1 ♀, same locality, v. 1909 (figs. 27 *b*, 29, 31).

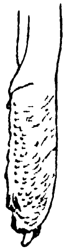
♂. Medium size; testaceous-brown, with yellow spots along the elytral edge. Head small, round; occiput adorned with two small brown stripes by the side of the eyes; frontal rostrum wide, flat, bordered; ocelli rather big and close, disposed on a curved line, the anterior one at base of the rostrum in a small depression; face yellow. Maxillary palpi with fourth joint a little shorter than third, fifth scarcely longer than fourth, a little widened and rounded at apex.

Pronotum slightly narrowing in front, with anterior and posterior margins almost straight; disk a little flattened,

27.



30.



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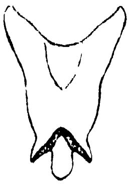

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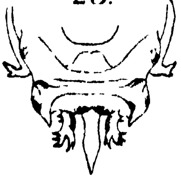


31.

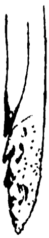


Fig. 27.—Right elytron of (*a*) *Madasumma marginipennis*, Sauss., and (*b*) *M. greeni*, sp. n.
Fig. 28.—Male genitalia of *M. marginipennis*.
Fig. 29.—Male genitalia of *M. greeni*.
Fig. 30.—Apex of ovipositor of *M. marginipennis*.
Fig. 31.—Apex of ovipositor of *M. greeni*.

mottled with brown; lateral lobes of the same colour as the disk, with inferior margin feebly convex.

Abdomen yellowish; subgenital plate rather short, wide, ending in a triangle, furrowed in the middle of its apical part.

Legs rufous, mottled with brown. Anterior tibiæ a little dilated at base, with external drum oval, internal one narrow, long, partly covered by the anterior margin of the foramen. Posterior tibiæ armed with five spines on each margin.

Elytra rather wide, slightly pubescent, testaceous-brown, with a few small yellow spots along the edge and a larger one beneath the speculum; speculum as wide as long; diagonal vein a little curved; first chord united to the speculum by two veinlets; seven oblique veins, three of which are long, parallel, two very much curved, and two almost straight; apical field presenting four discoidal sectors and a wide reticulation; mediastinal vein with fourteen to fifteen parallel close branches. Wings extending a little beyond the apex of elytra.

♀. Head, pronotum, and legs as in the male. Subgenital plate rather large, notched at apex. Ovipositor long, straight, its apical valves narrow, with shagreened surface, the granulations forming undulated stripes; inferior margin of the superior valves presenting a few rounded teeth and a big ridge near the apex.

Elytra testaceous, with a few yellow spots on the edge, pubescent, rather wide; disk presenting eight veins, of which the four basal ones only are very distinct, the others being partly lost in a wide irregular reticulation.

Length of body 18·5 mm.; length with wings, ♂ 26·5, ♀ 29 mm.; pronotum 3·8 mm.; elytra, ♂ 18, ♀ 20·5 mm.; posterior femora, ♂ 12·5, ♀ 14·5 mm.; ovipositor 19 mm.

This species is very close to *M. marginipennis*, Guér., but the elytra are wider (fig. 27, *a*, *b*), with mediastinal vein bearing more branches (six to seven only in *marginipennis*). In the male of *marginipennis* the speculum is slightly longer than wide, the oblique veins are disposed as 2 + 1 + 4; in the female the veins are much more distinct and the veinlets more regular, forming large, almost square areolæ; the ovipositor is also shorter (14 mm.), with apical valves strongly denticulated along their inferior margin, the inferior ones presenting three long teeth (figs. 30, 31). The male genitalia of both species are quite different (figs. 28, 29).

60. *Euscyrtus concinnus*, Haan.

Peradeniya, Kandy, Ambalagoda.

61. *Euscyrtus necydaloides*, Walk.

Peradeniya.

This species is not a *Patiscus* as W. F. Kirby thought, but a true *Euscyrtus* of the *crassiceps* group, with rather short posterior femora and very long ovipositor. It seems very close to *E. mæsoi*, Bol., but the latter has a still longer ovipositor and not quite so short posterior femora. Walker's description requires the following completion :—

Rather large, testaceous. Head a little wider than the pronotum, slightly flattened; frontal rostrum rather narrow, with parallel margins ; anterior ocellus at some distance from the apex. Eyes projecting, rounded. Maxillary palpi with fourth joint a little shorter than third, fifth rather small, with anterior margin convex, truncated at apex.

Pronotum with anterior margin slightly convex, posterior one a little sinuated ; disk somewhat flattened.

Abdomen yellowish brown ; subgenital plate rather large, almost flat. Ovipositor very long, flattened, almost straight, only slightly curved upwards near the apex, which is not very acute.

Legs rufous, rather short. Anterior and intermediate femora rather strongly swollen ; anterior tibiæ slightly enlarged at base, with two large oval drums. Posterior tibiæ armed with seven external and nine internal spines, which are blackish at top.

Elytra testaceous, extending almost to the apex of abdomen ; dorsal field with six oblique veins, two of which emerge from the discoidal ; transverse veinlets scarce, forming large somewhat irregular areolæ ; lateral field with two free veins and the mediastinal bearing one branch ; humeral vein furcate in its posterior half. Wings somewhat longer than the elytra.

Length of body 13·5 mm. ; length with wings 18 mm.; pronotum 2 mm.; posterior femora 10 mm. ; elytra 9 mm. ; ovipositor 17·5 mm.

LVIII.—*On the Third Collection of Spiders captured by Mr. C. S. Elton in Spitsbergen. Results of the Oxford University Arctic Expedition*, 1924. By A. RANDELL JACKSON.

IN October 1924 Mr. C. S. Elton sent me another collection of Spitsbergen spiders for identification. This is the third I have had from him altogether. Six species were represented, one of them—*Coryphæus holmgreni*—being new to Spitsbergen, the nearest previous record being Bear Island, for which up to now it is the only species of spider known.

The following are the localities for the species taken by the 1924 expedition :—

Leptyphantes sobrius, Thor.

Liefde Bay, Green Harbour.

Hilaira glacialis, Thor.

Deer Bay Island. Three females.

Coryphæus holmgreni, Thor.

Green Harbour. Two females.

Typhochrestus spetsbergensis, Thor.

Liefde Bay, Green Harbour.

In the previous collections this has been the most abundant species, but this time more examples of the next were obtained.

Erigone psychrophila, Thor.

A number of specimens, all from Liefde Bay.

Erigone arctica, White.

Three males and two females from Deer Bay Island; one somewhat doubtful female from Green Harbour.

All the Spitsbergen males I have seen of this species are of the typical form. The var. *maritima*, Kulcz., has not yet been found.

Altogether ten species of spiders are now known to inhabit Spitsbergen. Those not taken by the last expedition are *Micaria eltonii*, Jackson, *Leptyphantes hyperboreus*, Strand, *Micryphantes nigripes*, Sim., and *Erigone tirolensis*, L. Koch; all but the second have been taken by previous Oxford Expeditions.

The following is the analysis of the specimens; I have included immature examples, with the exception of five, which are quite unrecognizable:—

	Males.	Females.	Immature.	Total.
Erigone psychrophila, Thor.	13	22	15	50
Leptyphantes sobrius, Thor.	3	12	7	22
Typhochrestus spetsbergensis, Thor.	2	7	5	14
Erigone arctica, White	3	3	..	6
Hilaira glacialis, Thor.	..	3	..	3
Coryphæus holmgreni, Thor.	..	2	..	2
Unrecognizable	..	..	5	5
Total	21	49	32	102

Egg-sacs were found of *E. psychrophila*, Thor.

LIX.—*Some Notes on* Pheretima anomala, *Mich., and a related Species new to India and Burma.* By G. E. Gates, Lecturer in Biology, Judson College, Rangoon, Burma.

Michaelsen described *Pheretima anomala* (1907 and 1908) from eight specimens which were secured in the Botanical Gardens of Sibpur, Calcutta, and sent to him by the Indian Museum. The worm apparently has not been found since then, as there is nothing further concerning it in the literature of the Indian Oligochæta. It is therefore of interest to report its occurrence in Burma. The Rangoon forms may be described as follows:—

External Characteristics.—The length of the mature specimens varies from 116 to 162 mm., but the large majority are from 126 to 146 mm. long. The diameter in segment xxiv. is 4 to 6 mm.—in most specimens 5 mm. Numbers of segments in twelve specimens ranged from 120 to 130. The living worms are reddish dorsally, deeper anterior to the clitellum, and with a marked greenish or purple iridescence. The clitellum is brownish, and the worm is whitish ventrally. The preserved worms are reddish dorsally, tinged with grey posteriorly, with the colour confined to the region of the mid-dorsal line in the last third of the animal. The clitellum is yellowish, greyish, or greyish yellow.

In almost all the specimens the buccal cavity is extruded, so that it is difficult to make out the prostomium, but it may be considered as epilobous ca. ½. Secondary furrows occur on segments vii. to xiii. just anterior and posterior to the setal circles. The most anterior and posterior annuli of a segment occasionally have tertiary furrows.

The first dorsal pore is in 12/13, and is smaller than the succeeding pore in 13/14.

The setæ begin on ii. The setal circles have no dorsal or ventral break, *zz* being often slightly smaller than *yz*. The setæ are very closely set ventrally, more widely separated dorsally. On the ventral part of segment xvi. there is always a short row of setæ, the number varying from 12 to 23, but in the majority of cases being 20.

The clitellum is ring-shaped, xiv.–xvi. (3). Dorsal pores are rarely present. In a few cases the clitellum is not complete ventrally behind the row of setæ on xvi.

There are no spermathecal apertures. The female pore is in the usual position on xiv., easily visible. The male pores are in the setal circle on xx. separated by 16–18 setæ, generally the smaller number. The appearance of this region varies. There may be simply a large aperture in the body-wall between flat puckered lips; or the lips may be pushed outward into a slight cone, inside of which is a round, smooth, glistening papilla with a minute pore at its centre; or the lips may be pushed still further outwards as an erect cylindrical tube with a smooth glistening porophore projecting very slightly from the end. The smoothness of the porophore contrasts sharply with the wrinkled outer surface of the body-wall tube. Although these papillæ are confined to the region of the setal circle, the intersegmental furrows 19/20 and 20/21 are often bent slightly forward and backward in front of and behind them.

Segments xvii.–xix. and xxi.–xxiv. inclusive may have similar but slightly smaller and more widely-separated papillæ, also in the setal circle The number of the setæ between such papillæ varies from 17 to 21, but is usually 20. All stages of projection of these papillæ also occur, or there may be large openings with puckered lips similar to those often found on xx. A fine needle or scalpel can be inserted between the porophore and the projection of the body-wall in any segment on which the erect state of the papillæ occurs

Michaelsen stated (3, p. 190), "As a rule there are four pairs of such copulatory papillæ on the 18th, 19th, 21st, and 22nd segments." A table is given below showing the occurrence of these papillæ in the Rangoon worms. The numbers are inclusive and segment xx. is included, as these papillæ appear the same as those on the other segments. If the segment number only is given, a pair of papillæ is present. "Right" or "left" indicates that only the particular papilla noted is present on the segment mentioned: *e. g.*, left xvii.–right xxiii. means xvii.–xxii. on the left side and xviii.–xxiii. on the right. Different stages of projection of the papillæ are not noted.

Table A.

Segments.	Number of Specimens.
xvii.–xxi.	12
xvii.–xxii.	64
xvii.–xxiii.	24
xvii.–xxiv.	3
xviii.–xxii.	4
xviii.–xxiii.	8
xvii.–right xxiii.	17
xvii.–left xxiii.	18
xvii.–right xxii.	10
xvii.–left xxii.	12

Table A (*cont.*).

Segments.	Number of Specimens.
xvii.-left xxii. and left xxiii	2
xvii. right xxiii. and xxiv.	1
xvii.-right xxiii. and left xxiv	1
xvii.-xxi. and xxiii.	2
right xvii.-xxii.	1
left xvii. xxii.	1
right xvii.-right xxiii.	1
right xvii.-left xxiii.	1
right xvii., right xviii.-xxiii.	1

In addition to the above, two specimens have been found in which the male papillæ are on xix. instead of xx., and one specimen with the male papillæ on xxi. In these cases segment xx. had a pair of the slightly smaller papillæ usually characteristic of the other segments. In all these cases the papillæ of all the segments looked so much alike that the abnormality was not discovered until dissections were made.

Internal Structure.—Septa 4/5, 5/6, 6/7, 7/8 are present and thickened; 8/9 is also thickened and, although attached normally to the parietes in the region of the intersegmental furrow 8/9, breaks up into fibres internally, which continue the septum to the point of attachment on the posterior part of the gizzard.

The attachments of the next three septa are such that a correct determination of the relationships in this region is difficult to make. A rather tough but thin septum is attached to the parietes in the region of the setæ on xi. Although this is single close to the attachment to the body-wall, it can be seen internally (by internally is meant a direction from the body-wall towards the centre of the segment) to be double, and that the two parts are bulged out by the contents. When this is cut open on either side, it is found to contain the lateral commissure, the testis, and the male funnel of that side. From the anterior face of the septum project a pair of male funnels, which are in this case unusually far from the testes. The anterior part of the septum can be traced downwards to the parietes just in front of the posterior part. What appears to be a continuation of this part of the septum can sometimes be traced forwards on the ventral parietes to the furrow 9/10. This anterior part must be 9/10, which is attached ventrally at the usual place, and then continued backward on the ventral body-wall until just in front of 10/11, where it rises from the floor of the segment fusing outwardly—that is, close to the lateral and dorsal parietes—with 10/11, in such a way as to form a testicular chamber, which is really a reduced segment x. The funnels projecting from the anterior face of this double septum are those of ix.

The testes and funnels of segment xi. also are not free, but are confined in a similar chamber formed by some sort of a connection between the posterior face of 10/11 and the anterior face of 11/12, which is normal in position. In some specimens this chamber appears to be formed by the coming in contact and fusing of these two septa in a horse-shoe-shaped line around or over the alimentary canal. In other specimens there appears to be a sheet of connective tissue, which forms the attachment between the two septa.

Conditions are often, perhaps always, further complicated by the presence of a longitudinal sheet of connective tissue which extends beneath the gut from the septum at xi. to 13/14. This curves upwards at the sides and is attached dorso-laterally to the œsophagus. This sheet forms the inner wall of the testicular chambers. In one or two exceptionally fine specimens there is some indication of the presence of two other vertical longitudinal sheets of tissue which drop from the sub-œsophageal sheet straight down to the ventral parietes. But if these are present they are exceedingly thin and fragile, and broken in course of the dissections. If present they divide the segment x. into two testicular chambers and a small ventral chamber between. The testicular chamber of xi. will then be marked off in the same way.

Between the attachment of the septa at the level of the setæ of xi. and the septum 11/12 there is then an outer annulus, inner testicular chambers formed by fusion of the septa concerned, or paired testicular chambers with a ventral chamber containing the nerve-cord between, and an inner periœsophageal annulus internal to the testicular chambers.

The gizzard is not very large, is subspherical, and in segment viii., although in the dissections it lies between the level of furrow 8/9 and the setæ of xi. There are large paired lateral sacs on the intestinal wall in segments xxi.–xxv. Cæca arise in xxvi., and extend forward into xxiii. or xxii. The typhlosole begins in xxvi., and extends into the posterior half of the intestine. Anteriorly this appears as a solid ridge of tissue, but posteriorly it seems to be formed of segmental flaps of tissues hanging in the lumen of the intestine, in such a way that the forwardly-directed anterior edges of one pair project between the posterior edges of the pair next in front. The paired flaps are fused ventrally.

The last pair of hearts is in xiii.

Nephridial masses in v. and vi. are attached to the anterior faces of 5/6 and 6/7, dorso-lateral to the alimentary canal.

Paired testes and funnels lie free in segments v.–xi. There are no seminal vesicles. The prostates are large, and lie in segments xvii. to xxiii. The duct is in xx. After emerging from the gland it passes towards the nerve-cord, bending into a U-shaped loop with the concavity opening anteriorly. The inner side of the U turns posteriorly and then outwardly, rapidly enlarging, and forms a still larger loop with the concavity opening outwardly, then passing downward at the edge of the prostate into a small roundish bulb of tissue, through which it continues as a fine thread. In segments xvii. to xxiv., corresponding to the external papillæ, are mushroom-shaped glands. The head of the gland is spherical, and composed of a soft downy tissue, which very easily tears apart when probed with needles. The duct is perpendicular to the gland and to the parietes, but is often concealed under the glandular tissue, so that it is not visible in the dissections. The duct is short, stout, and glistening.

There are no spermathecæ. The ovaries and the female funnels are present in xiii. in the usual positions.

Distribution in Burma.—Rangoon, Insein, Thonze, Zigon, Prome, Bassein, and Pyapon, in the months of June to December. The worm has been obtained from gardens, ditches, and lawns in the city, and also from the neighbouring jungle. In Rangoon, at least, it never seems to be common, as a coolie bringing in a collection of 100–200 worms, as the result of his morning's work, will only have secured two to ten specimens of this form, and yet nearly every such collection made during the rainy season in Rangoon contains several. In Prome, in the month of August, this species is the commonest.

Since this species had been previously reported only from a botanical garden, it appeared at least possible that its real home might be Burma, and that it had been carried to Sibpur in a botanical shipment. In reply to a query on this matter, the Superintendent of the Botanical Garden in Sibpur wrote that he had no records of shipments prior to 1908. Worms have been transported in such shipments to London and Hamburg from the tropics, and transfer between Burma and Calcutta must be much easier. The widespread occurrence in Burma, the absence of reports of further occurrence in Bengal for the last sixteen years, together with the fact that Burma belongs to the "*Pheretima* domain," bear out this idea. Stephenson, in the

"Fauna" volume (p. 27) says, "The Indo-Gangetic plain is the chief home of *Eutyphœus*, while at its eastern end it just includes the western edge of the *Pheretima* area (two indigenous species at Calcutta)." These two species are *P. anomala* and *P. alexandri*. This latter was described by Beddard from a single specimen imported to the Kew Gardens from Calcutta about 1900, and has not since been found. Michaelsen considers it to be possibly identical with *P. heterochæta*. It may then be possible that Calcutta is entirely outside of the real "*Pheretima* domain."

THE RELATED SPECIES.

In collections of worms made in three particular localities of Rangoon, *P. anomala* occurred in unusually large numbers. In these collections there was also obtained a worm which has not been found elsewhere in the Indian Empire, and which differs from all other members of this genus hitherto reported from Burma and India, with the single exception of *P. anomala*, in one important point of structure. The literature of this genus is extensive, and a large part of it is not available in this province. The author is therefore unable to determine whether this species has previously been recorded.

Description of the Type-Specimen.

External Characters.—Length 122 mm. Diameter behind the clitellum 6 mm Number of segments 127.

The colour of the live worm is a reddish shade, slightly deeper than that of *anomala*. The formalin-preserved specimen is reddish dorsally and whitish ventrally. The clitellum is reddish brown, but in other specimens is brown or yellowish brown. Behind the clitellum the red colour is more extensive than in *anomala*.

The buccal cavity of all specimens examined is extruded. The prostomium is probably epilobous about ½.

The first dorsal pore is in 12/13 ; pores are often present on the clitellum and functional. There also appears to be a dorsal pore in 11/12, but on close examination this proves to be a weak spot in the epidermis on the anterior part of xii. close to the intersegmental furrow; this "pore" does not seem to pass through into the body-cavity, as numerous efforts in more than thirty specimens to squeeze out the cœlomic fluid at this place failed.

Secondary furrows occur on segments ix. to xiii. inclusive.

On these segments there is a deep furrow just anterior to the setal circle and a slighter furrow posterior to the setal circle.

The setæ begin on ii. The setal circles are complete, without dorsal or ventral break. The setæ are more closely set ventrally than dorsally. The numbers are v./86, xiii./86, xxiv./83. There are twenty setæ in a row on the ventral part of segment xvi.

The clitellum is ring-shaped on segments xiv.–xvi. (3).

The spermathecal apertures are wide openings located in 5/6, 6/7, and 7/8, about one-quarter of the circumference apart, at about the eighth or ninth seta (16–18 setæ apart). The female pore is single and in the usual position on xiv. There are no visible male apertures; but from internal dissection they are usually on segment xx., sometimes, perhaps, on xix. or xxi. Genital markings and papillæ are entirely lacking.

Internal Anatomy.—Septa 4/5, 5/6, 6/7, and 7/8 are present and slightly thickened; 8/9 is vestigial and present ventrally as a sheet or sheets of connective tissue attached to the parietes in the region of intersegmental furrow 8/9 and internally to the posterior part of the gizzard; 9/10 appears to be absent; 10/11 is displaced backwards and attached to the parietes under the setal circle of xi. Septa 11/12, 12/13, and 13/14 are slightly thickened. The following septa are thin.

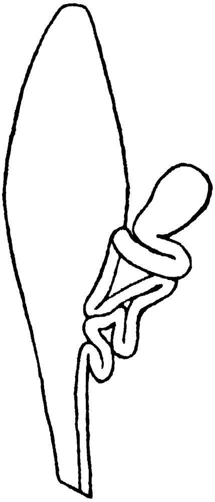
The gizzard is in viii. It is subspherical, and in the dissection lies between the levels of furrow 8/9 and setæ on xi. The intestine begins in xv. Paired cæca extend from xxvii. to xxiv. on the left side and xxiii. on the right side. In the latter segment the cæcum is bent upward and then forward again. There are five pairs of intestinal sacs laterally as in *anomala.* The typhlosole begins just behind the origin of the cæca. It consists of a longitudinal series of short paired segmental folds similar to *anomala.*

The last pair of hearts is in xiii.

Under septum 10/11 are two pairs of commissures. A small pair of vessels on the gizzard then represent the vessels of the eighth segment and the two pairs under 10/11 those of ix. and x. In most specimens, however, one of the anterior pair of commissures under 10/11 is missing or only very slightly developed. The commissures belonging to segment x. passed ventrally into the septum 10/11. This septum appears to be double in the immediate vicinity of the nerve-cord, and between the two folds lies the anterior pair of testis-sacs. In a very few dissections a thin sheet of connective tissue was traced from furrow 9/10 on the floor of segments x. and xi., as marked by the external segmentation, on to the anterior face of septum 10/11. It is therefore possible that this septum represents a fusion of 9/10 and 10/11, and that segment x. has been reduced to the small pocket in the septum which contains the testis-sacs.

Large nephridial masses are attached to the anterior faces of septa 5/6 and 6/7, dorso-lateral to the alimentary canal.

The large white funnels and the testes are contained in four nearly spherical sacs which lie close together under septa 10/11 and 11/12, grouped in such a way as to form two crescent-shaped bodies with the opening of the crescent directed anteriorly. The seminal vesicles are two pairs, large, lobulated, in segments xi. and xii. The vasa deferentia of a side come together just behind 12/13, but do not unite at once, as they can be separated from each other by a sharp needle for another segment at least. The united vasa deferentia lie on the ventral body-wall covered over by a loose connective tissue, which can be easily dissected off so that the ducts can be traced without difficulty to segment xx., where they thin out into a fine thread which passes into the body-wall. There are no prostates.



Pheretima sp. Spermatheca.

The three pairs of spermathecæ are in segments vi., vii., and viii. The ampulla is longer than the duct, of which it is an ovoid expansion. The diverticulum arises at the very base of the duct and passes up on to the ampulla, where it is coiled a number of times. The free end of the diverticulum is slightly enlarged and lies at or above the middle of the ampulla. After cutting the connective tissue between the loops and straightening out the diverticulum, its length is greater than the total length of the duct and ampulla (see text-fig., p. 545).

Distribution.—Rangoon and Insein, September to December; Bassein, October. It is found together with *anomala*. The latter may be found without the present species, but the species under discussion has not been obtained from any locality which did not also have *anomala.*

Remarks.—The ending of the vas deferens seemed so unusual that a number of specimens were examined. In segments xix. or xx. the duct suddenly dwindles to a very fine thread, which is exceedingly difficult to trace further. In some specimens it could be followed no further than xix. and seemed to pass into the parietes there, while in others it could be traced into xxi. where it disappeared from view. In the majority of worms examined it passed into the parietes in xx.

In a recent batch of worms examined, which contained an unusually large number of the species just described, were two very evidently belonging to the same species, but which had protruding papillæ exactly the same, so far as could be determined with the binocular dissecting microscope, as those on segments xvii.–xxiv. of *anomala.* These two worms are described below as types B and C, and the type just described will be hereafter referred to as type A. Only the points of difference from the type-specimen are noted.

Type B.

External Characteristics.—Length 128 mm. Diameter behind the clitellum 6 mm. Number of segments, 124. About eight or nine setæ from the middle of the segment, in the setal circle of xx. on the left side is a single protruding papilla of the *anomala* type. Although this is confined to the region of the setal circle the furrows 19/20 and 20/21 are bent forward and backward slightly in front of, and behind, the papilla. There are no other genital markings or papillæ.

Internal Characteristics.—The vasa deferentia are spirally coiled in segments xvii., xviii., and xix. In xx., on the left side, there is a small mushroom-shaped gland of the *anomala* type. The vas becomes very thin and thread-like in this segment, but can be followed to the anterior edge of the gland around which it bends on the outer side. Beyond this the vas cannot be traced with certainty.

Type C.

External Characteristics.—Length 134 mm. Number of segments, 123. Diameter 6 mm. A single papilla similar to that described for type B occurs on the same segment but on the right side.

Internal Characteristics.—The vasa deferentia of each side lie together in xiii. and xiv. and unite in xv. In segment xx. on the right side there is a small prostate of two equal lobes. The duct as it emerges from the gland is fine and about the same thickness as the vas with which it unites, but it gradually enlarges, bending into two loops as in the *anomala* duct.

FURTHER TYPES.

An intensive search for a week of the locality which had yielded types B and C was made, as a result of which 197 specimens were secured. Of these 162 had no papillæ or male pores, and agreed, so far as they were studied, in both external appearance and internal anatomy with type A. The remaining 35 specimens had *anomala* papillæ in various positions as shown by the following table.

Table B.

One papilla on the right side of segment				xvii.	1
,,	,,	left	,,	,, xvii.	1
,,	,,	right	,,	,, xviii.	1
,,	,,	left	,,	,, xviii.	1
One pair of papillæ on segment xviii.					1
One papilla on the right side of segment				xix.	1
,,	,,	left	,,	,, xix.	1
,,	,,	right	,,	,, xx.	6
,,	,,	left	,,	,, xx.	6
One pair of papillæ on segment xx.					5
One papilla on the left side of segment xx. and a pair of papillæ on segment xxi.					1
Paired papillæ on segments xvii., xviii., xix., and xx.....					10

In all worms having a single papilla on xvii. or xviii. there was a mushroom gland in the same segment. Of the two which had a papilla on xix., one had a small single-lobed prostate and the other had a mushroom gland. The remaining worms may be classified into the three following types.

Type D.

External Characteristics.—Length 120 mm. Number of segments, 124. Diameter behind the clitellum 7 mm. Paired papilla on segment xx.

Internal Characteristics.—On each side the vasa deferentia come together just in front of 12 13 and pass straight back into xx. On the right side in this segment there is a mushroom gland. The vas passes up the anterior edge of this gland and appears to pass into the interior of the glandular head, but this can be lifted off without tearing the glandular tissue, which is merely folded over the vas, which emerges on the posterior edge and drops on to the body-wall, into which it passes. On the left side of this same segment is a small prostate, which projects into xxi. The vas joins the prostate duct as it emerges from the gland. The duct is coiled as in *anomala*, and although the gland is much smaller the duct is approximately the same size as in *anomala*.

Type E.

External Characteristics.—Length 122 mm. Number of segments, 127. A pair of protruding papillæ on segment xx. in the setal circle separated by twenty setæ.

Internal Characteristics.—A pair of small prostates confined to segment xx. The gland-ducts and vasa deferentia same as in type D, except as previously noted.

A specimen 135 mm. long with 126 segments had a single papilla on the right side of xx. and a pair on xxi. Internally there is a mushroom gland in the right side of segment xx., while on the left side of the same segment there is a small prostate. The duct emerges from the gland close to 20/21, and at once passes through the septum so as to lie in xxi., where it is typically coiled. On the right side of this segment there is a small single-lobed prostate with a large characteristic duct.

Type F.

External Characteristics.—Length 135 mm. Diameter 5 mm. Number of segments, 126. There are 24 setæ on xvi. There are no protruding papillæ, but large pores with puckered lips in the setal circles on xvii.–xx. Between the pores there are the following numbers of setæ:—xvii. 16, xviii. 17, xix. 16, and xx. 15. The spermathecal pores in

5/6, 6/7, 7/8 are not easily visible. These ten specimens resemble *anomala* superficially more than any of types A to E. The latter are all thicker and look much fatter. In fact, in sorting over the living animals, this type was included with *anomala* until a dissection revealed the difference.

Internal Characteristics.—Mushroom glands in pairs in xvii., xviii., and xix. Large paired lobulated prostates in segments xix.–xxiii. The prostatic ducts in xx. are coiled as in *anomala*. One of these specimens had an accessory spermatheca on the left side of segment v. Seminal vesicles as in A–E.

Conclusion.—Type A is a worm new at least to Burma and India. It does not at first seem to be related to *P. anomala*, as the only important characteristic the two worms have in common (outside of common generic characteristics) is the ending of the vasa deferentia in segment xx., and the value of this is weakened by the absence of visible male pores and the thinning out of the vas, which cannot be traced with certainty to an external pore in any of the dissections. This type (A) has spermathecæ, testes and funnels in testis-sacs, and paired seminal vesicles, all of which are lacking in *anomala*. The latter has five to seven pairs of mushroom glands, large prostates, and five additional pairs of testes and funnels which the former lacks. These differences might ordinarily be expected to sharply differentiate two species. Specimens have just been described, however, which have the same spermathecæ, testis-sacs, and seminal vesicles as A, and are very evidently the same species, but which have in addition the *anomala* mushroom-glands, prostates, and prostatic ducts. These link-forms are rare, and all five varieties together (types B–F) are only one-fifth as common as A. The differences between these types are differences in the occurrence of mushroom glands and prostates.

In all other Pheretimas of Rangoon the papillæ are quite characteristic and furnish a means for specific determination. The presence of the same unusual papillæ, together with the same mushroom-glands, prostates, and ducts in the two worms would seem to indicate a relationship of some sort. This is further supported by the marked similarity in external appearance between one of the types described (F) and *anomala*.

Just what this relationship may be the writer does not at present care to suggest, but it may not be out of place to call attention to two facts which are of value in this connection. The first is the limited seasonal distribution of types A–F, which have been found during the last three years only in the months of September, October, and November, while *anomala* is found from June to December. The second is the finding in an undoubted *anomala*, just as the finishing touches are being put to this article, of what may be regarded possibly as incipient seminal vesicles. These are small stalked bodies on the posterior face of septum 11/12. The stalks are attached to the septum just behind the testes of the preceding segment, pass upwards on the septum, and are very slightly enlarged at the free end. The whole thing is too small to dissect and has not been studied further. The worm was, with this single exception, true to the *anomala* type. All specimens of *P. anomala* and the related types brought into the laboratory are being examined for further evidence in connection with this problem, and it is to be hoped that the results of the next season's collecting will furnish the desired evidence.

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LX.—*Some Bees from New Zealand.*

By T. D. A. COCKERELL, University of Colorado.

THE extremely limited bee-fauna of New Zealand has often caused comment *, but it is only proper to remember that our statistics are doubtless faulty, since there has never been a special student of these insects in the country. I give an account here of three species obtained by the well-known entomologist Mr. G. V. Hudson, and transmitted to me by Dr. G. A. K. Marshall. The species from Mt. Egmont represent, I believe, the first mountain-bees yet obtained in New Zealand; it is probable that collecting on the various uplands and peaks will produce a number of novelties.

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* For particulars see Proc. Acad. Nat. Sci. Philadelphia, May 1916, p. 360.

Paracolletes monticola, sp. n.

Male.—Length 8·5 to 9·5 mm.

Shining black, the abdomen very faintly purplish; antennæ black, the flagellum very obscurely brownish beneath. Wings greyish hyaline; stigma large, dark brown; nervures black; second cubital cell conspicuously narrowed above, receiving the recurrent nervure very slightly before its middle. The triangular basal area of metathorax dull or dullish, without distinct ridge or sculpture; middle of face and region between antennæ with long pale hair, slightly fulvous, but sides of face with black hair, all black between antennæ and orbits. Head above with black hair, but cheeks with long pale hair; thorax with black hair, but light on sides except above, and pallid behind bases of wings. Legs black, with scanty light hair; abdomen with scanty long pale hair beneath, and above to about middle of second segment, beyond that black. The clypeus is very minutely punctured, the supraclypeal area polished. The dark nervures and dullish area of metathorax show that this cannot be the ♂ of *P. imitatus*, Smith. The separation from *P. boltoni*, Ckll. (of which I have the male, taken by B. Veitch at Rotorua, Dec. 1919), is more difficult, but the new form has considerably longer hair on abdomen, duller area of metathorax, purplish-black abdomen, and longer and darker stigma. From *P. vestitus*, Smith, which was described from Wellington, it is known by the very dark nervures and large amount of black hair on head and thorax.

Two ♂, Mt. Egmont, North Island, 3000 ft., Jan. 1923 (*G. V. Hudson*). Nos. 1036 (type) and 1039.

I have supposed *P. vestitus*, Sm., ♂, from Greymouth, on the South Island, taken by Koebele, but I now suspect that it may prove separable.

Paracolletes hudsoni, sp. n.

Male.—Length 8·5 mm.

Similar to the last, and at first appearing identical, but certainly distinct by the following characters:—Abdomen shining, pure black; wings clearer, the smaller and more slender stigma reddish, narrowly margined with black; second cubital cell square, hardly narrowed above, receiving recurrent nervure conspicuously before middle; hair of face and region of antennæ long and shining white, between antennæ and orbits white, rather narrowly black next to the eyes; the black hair on abdomen above is only about half as long. These characters associate it with *P. confusus*, Ckll., of which only the ♀ is known, but that has the basal area of metathorax transversely striate, and the wings differently coloured.

Three ♂; Mt. Egmont, 3000 ft., Jan. 1923 (*G. V. Hudson*). No. 1039.

Hylæus hudsoni, sp. n.

Male.—Length about 7·5 mm.

Pure black, with the following parts pale reddish cream colour, a sort of very dilute ochreous: clypeus, lateral face-marks, mandibles (except cutting-edge), tubercles, and a pair of stripes on upper border of prothorax; no supraclypeal mark; clypeus very high, longer than broad; lateral marks shaped like feet in the attitude of dancing, but ending very acutely on orbit above, the part above top of clypeus hardly longer than the part below; front broad, entirely dull; antennæ very long. Eyes strongly converging below, but face broad. Mesothorax slightly shining but not polished, minutely and quite closely punctured; scutellum shining, also finely punctured; area of metathorax dull, the microscope shows irregular weak vermiform rugæ; mesopleura shining, very minutely punctured; tegulæ black. Wings smoky hyaline, stigma and nervures piceous; first recurrent nervure reaching basal corner of second cubital cell, second some distance from end of cell. Legs black; abdomen moderately shining, excessively minutely punctured; second segment with a transverse subbasal ridge. Underside with thin silvery-white hair.

One ♂, Lake Horocohenua, Feb. 19, 1901 (*G. V. Hudson*). No. 15*a*.

This resembles *H. relegatus*, Smith, in which the first recurrent enters apex of first cubital cell, and the clypeus is not so high, with the result that the part of the lateral marks above its upper edge is longer than the lower. Certainly the two species are closely allied, but I believe I am correct in separating *H. hudsoni*. I possess no *H. relegatus*, but have notes and sketches made from Smith's type (see Ann. & Mag. Nat. Hist., Oct. 1909, p. 313).

The following notes may be of use to students of New Zealand bees:—

(1) *Halictus familiaris*, *Paracolletes fulvescens*, *Hylæus capitosus*, *H. relegatus*, and *H. agilis* were all described by Smith from specimens taken by C. M. Wakefield in Canterbury Province, South Island.

(2) *Hylæus vicinus*, Sichel, 1867, was discovered on the 'Novara' expedition at Auckland, and has not been seen since. It is a rather large species, ♂ 8–11 mm., ♀ 10–14 mm., according to Sichel, but he confused another (Tasmanian) species with it. Abdomen bluish; flagellum rufo-piceous below; face of male yellow, as also scutellum and tubercles; female with lateral face-marks; tarsi pale red. This is the only New Zealand representative of an Australian group of *Hylæus*; as to its position in the series, see Ann. & Mag. Nat. Hist., Feb. 1910, p. 135.

(3) Careful comparison should be made between the bees of the North and South Islands. As indicated above, I am not at all sure that the South Island *Paracolletes vestitus* is really identical with that from the North Island; but good series, with both sexes, should be compared.

(4) No bees are known from any of the smaller islands, nor from Norfolk Island.

(5) The biology of the New Zealand bees should be investigated: their nests, when they fly, what flowers they visit, what enemies or parasites they have.

(6) There is always the hope of finding an endemic genus; if discovered, it will doubtless be a small bee.

LXI.—*A Comparative Study of the Otoliths of the Neopterygian Fishes* (continued). By G. Allan Frost, F.L.S., F.G.S., F.Z.S.

[Plate XXIX.]

II. Order OSTARIOPHYSI.

A. Suborder Cyprinoidea.

In the suborder Cyprinoidea, the lagenar otolith, the asteriscus, is generally the most developed, its position in the cranium varying in the different divisions. In the Characiformes, Gymnotiformes, and in *Barilius* among the Cypriniformes, the lagena is contained in lateral capsules, or open recesses, in the cranial cavity, above the floor supporting the brain. In the remainder of the Cypriniidæ it is generally enclosed, with the sacculus, in one of two lateral excavations, lying on each side of the *cavum sinus imparis* in the basioccipital bone; these excavations are entirely roofed over and communicate with the cranial cavity only by two anterior foramina; the roof forms the floor supporting the hind part of the brain.

The utricular otolith, the lapillus, is small as a rule in the Characiformes, but it is well developed in the Gymnotiformes and Cypriniformes; it is always lodged in an ope lateral recess of the cranial cavity. In the Cypriniidæ th lapillus may be remarkably different in form in closel related species, in which the lagenar otoliths are so simila in some instances, as to be almost indistinguishable. Th sagitta is small and attenuated throughout the suborde and is generally in close proximity to the asteriscus, an exception being *Barilius*, in which it is lodged below the floor in the centre of the cranial cavity.

Div. 1. CHARACIFORMES.

The otoliths of *Hoplias malabaricus* (= *Macrodon trahira*) (fam. Characidæ) are all well defined, the asteriscus (Pl. XXIX. fig. 1) being by far the largest, and the lapillus (Pl. XXIX. fig. 2) coming next in point of size; the sagitta (Pl. XXIX. fig. 3) is small and attenuated. The asteriscus is ovate, the outer side flat with radiating furrows, the inner side slightly convex. The dorsal rim is domed, with a deep notch in its anterior part; the ventral rim is rounded, with a similar anterior notch, and the posterior rim is curved; all the rims are serrated. The front of the otolith consists of a rectangular rostrum, overhung by a heavier pointed antirostrum, an excisura dividing them. There is a well-defined sulcus opening on the centre of the frontal rim; an angle of its lower line divides the ostium from the rounded caudal termination, which is situated in the centre of the otolith; there is a slight crest on the upper and posterior edges of the sulcus.

In *Alestes macrolepidotus* (Pl. XXIX. fig. 4) and *Hydrocyon forskalii* (Pl. XXIX. fig. 5), both of the family Characidæ, and in *Gastropelecus stellatus* (Pl. XXIX. fig. 6), of the family Gastropelecidæ. the asteriscus is drop-shaped, flat, and pointed dors ly; the posterior and ventral rims are rounded, and in *Ales* are strongly serrated, the serrations being slighter in *Hydrocyon* and *Gastropelecus*. Anteriorly there is a slight antirostrum above the opening of the sulcus. In *Pseudochalceus perstriatus* (Pl. XXIX. fig. 7) the dorsal rim is curved, and the ventral rim straight, with an angle anteriorly at its junction with the frontal rim, the posterior rim is rounded and serrated. In all these the sulcus opens on the centre of the frontal rim ; its general shape, curving first upwards and then downwards, with the lower edge bulging dorsally, resembling a hook.

In *Chirodon alburnus* (Pl. XXIX. fig. 8) the asteriscus is lower than that of the preceding species, the height and length being about equal ; the shape is roughly circular and both sides are flat. The dorsal rim is slightly domed, the ventral rim is flat, and the posterior rim is rounded. The sulcus opens on the centre of the frontal rim, and resembles that of *Hoplias* in having a rounded termination, but is more curved and without crests. There is a slight excisura.

In *Curimatus dobula* (Pl. XXIX. fig. 9), of the family Anostomidæ, the form is lower than in *Chirodon*, the length exceeding the height. The sulcus opens on the centre of the frontal rim, its form resembling that of *Chirodon* though somewhat straighter ; there is a groove surrounding it, but it is without raised crests. There is a notch below the mouth of the sulcus, and below this is a small anterior process.

In *Citharinus citharus* (Pl. XXIX. fig. 10), of the family Citharinidæ, the asteriscus is very large in proportion to the size of the fish. It is elongated, ovate, and biconvex, and is thick and heavy. The dorsal and ventral rims are curved, and the posterior rim is rounded. The front consists of a rostrum and antirostrum, the latter being more produced than the rostrum. The sulcus is divided equally into ostium and cauda by upper and lower angles of the edges, both ostium and cauda being ovate in shape ; a broad ornamental crest, divided into radially inclined segments, surrounds the sulcus. This is a highly specialized type, resembling, in the shape of the cauda and in the heavy crest, the asteriscus of the Cyprinidæ. It also bears a marked resemblance to the otolith of *Ictiobus cyprinella* (Pl. XXIX. fig. 15) of the family Catostomidæ.

In another member of the family Citharinidæ, *Icthyoborus besse* (Pl. XXIX. fig. 11), the otoliths show a marked advance towards the Cyprinid type ; roughly circular in shape, they retain the flatness of the Characid type, but the outline is distinctly Cyprinid in form. The dorsal rim is domed with a median pointed apex, the ventral rim is straight, and the posterior rim is rounded. Anteriorly there is a large antirostrum, but no rostrum or excisura. The sulcus is sac-shaped, the lower line being looped up anteriorly as in *Hydrocyon* and *Gastropelecus*; this feature seldom occurs in the Cyprinidæ, an exception being *Barilius*. There is a slight crest round the sulcus.

In *Distichodus rostratus* (Pl. XXIX. fig. 12), also of the family Citharinidæ, the otolith is similar in many features to that of *Icthyoborus*; the dorsal and posterior rims are the same, but the ventral rim is more curved, and is not truncated as in *Icthyoborus*, the lower part of the otolith slightly exceeding the upper in length. The sulcus is sac-shaped as in the Cyprinidæ, in contrast with that of *Icthyoborus*, in which the lower line is distended dorsally.

Div. 2. GYMNOTIFORMES.

In *Gymnotus carapo* (Pl. XXIX. fig. 13), of the family Gymnotidæ, the shape is ovate and both sides are flat. The position is vertical as in *Hoplias*; the dorsal, ventral, and posterior rims are slightly serrated. The front of the otolith is straight, and there is no rostrum, antirostrum, or excisura. The sulcus is short and has a rounded termination as in *Hoplias* and *Chirodon*.

In *Sternopygus macrurus* (Pl. XXIX. fig. 14), of the family Sternarchidæ, the otolith is of the same ovate upright form as in *Gymnotus*. The dorsal, ventral, and posterior rims are curved; the frontal rim is straight, with a slight anterior ventral projection. There is no rostrum, antirostrum, or excisura. The sulcus opens in the middle of the frontal rim and curves downwards to its termination, the form being intermediate between that of *Chirodon* and the hook-shape present in *Gastropelecus*. The otoliths of the Gymnotiformes are not far removed from those of the typical Characiformes, from which type they have apparently been derived.

Div. 3. CYPRINIFORMES.

Pl. XXIX. fig. 15 shows the otolith of *Ictiobus cyprinella* of the family Catostomidæ. The shape is ovate, with the outer side flat and the inner rather convex. The dorsal rim is curved and serrated, the ventral rim slightly concave, and the posterior rim has a square projection. The front of the otolith consists of a prominent antirostrum as in *Icthyoborus*, a slight rostrum, and a projection of the lower crest of the sulcus, similar to that of *Barilius* (family Cyprinidæ). The sulcus is divided by upper and lower angles into ostium and cauda, the shape of the sulcus and the upper part of the otolith closely resembling that of *Citharinus* (fig. 10). The modification of the lower part, and the presence of a crest surrounding the sulcus, brings this otolith close to the Cyprinid type.

In the family Cyprinidæ, the asteriscus is always the largest otolith, though in *Leuciscus cephalus* (Pl. XXIX. fig. 23) and in *Tinca* the lapillus approaches it in size. The lapillus is extremely variable, seldom showing any resemblance even in nearly related species; it is therefore helpful in identification, and of considerable interest in the examination of hybrid examples. The sagitta is small, and has the form of a slender curved rod, posteriorly produced into a needle-like projection, and anteriorly widened into a narrow plate. The relative sizes of the three otoliths in the Cyprinidæ are shown on Pl. XXIX.

The otoliths of *Barilius alburnops*, while generally conforming to the Cyprinid type, present certain Characid features. Mr. Regan regards *Barilius* as one of the most generalized of the Cyprinidæ, and a study of the otoliths is in accordance with this conclusion.

The asteriscus (Pl. XXIX. fig. 16) is roughly circular, it is flat on both sides as in the majority of the Characiformes, and the crest surrounding the sulcus is very low. The dorsal and posterior rims are rounded, the ventral rim is straight, and all are serrated; the ventral rim is truncated, as in *Ichthyoborus*. Frontally there is an antirostrum and there is also a projection of the lower crest of the sulcus as in *Ictiobus*. The sulcus has the lower line domed as in the Characid type, and resembles the scimitar-form of *Hydrocyon* and *Pseudochalceus*. The lapillus resembles in outline that of *Hoplias*, but differs in having a crescent-shaped sulcus anteriorly on the outer side. The relative size of the sagitta is about the same as in *Hoplias*. The otoliths of *Barilius* therefore appear to be as near to those of the Characiformes as to the Cyprinid type, presenting features of both, and also showing relations with the Catostomidæ as exemplified by *Ictiobus*.

The asteriscus of *Rutilus rutilus* (Pl. XXIX. fig. 19) is only slightly larger than the lapillus. It is ovate, the length exceeding the height. The outer side is convex with radiating furrows, and the inner side is flat, but with a heavy raised crest surrounding the sulcus. The dorsal rim is curved, the posterior slightly pointed, and the ventral rim truncated and rounded anteriorly. The front consists of a prominent antirostrum and an angular projection of the lower crest of the sulcus. The sulcus is sac-shaped, with the lower line distended ventrally. The lapillus (fig. 20) has the anterior rim rounded and there are two rounded posterior projections. The sagitta (fig. 21), which is small, has the anterior half flattened.

In *Leuciscus cephalus* (Pl. XXIX. fig. 22) the asteriscus is higher than in *Rutilus*, the upper crest of the sulcus is broader, and the sulcus more dilated posteriorly. The antirostrum is heavy; there is the same anterior projection of the lower crest of the sulcus, and there is a slight excisura below it. The lapillus (Pl. XXIX. fig. 23) is heavy, and very little smaller than the asteriscus; there is a fan-shaped projection on the dorsal rim, and a smaller rounded process; ventrally there is a lateral fold and a slight projection, also to be found in *Rutilus*. The sagitta (Pl. XXIX. fig. 24) has a beak-like process on the dorsal rim, extending from the flat anterior part to the middle of the otolith, and there is also a median ventral keel: the relative size of the otoliths is about the same as in *Rutilus*.

In *Barbus barbus*, the asteriscus (Pl. XXIX. fig. 25) is very similar to that of *Rutilus*, but the posterior and ventral rims are more rounded and the otolith is heavily serrated, the furrows extending to the inner side. The crest surrounding the sulcus is broad and raised, and is serrated. In front of the truncated ventral rim there is a small pointed process ventrally inclined. The lower line of the sulcus is straight, and meets the upper line in an angle behind the anterior projection of the sulcal crest. The lapillus (Pl. XXIX. fig. 26) is much smaller than the asteriscus; it is roughly triangular in shape, the wider end being bulbous, with rounded angles, the other end narrowing to a rounded point. The sagitta (Pl. XXIX fig. 27) is considerably larger than in the preceding species, and dorsally has a median projection, blunter than in *Leuciscus*, and there is a ventral keel to the anterior part of the otolith.

In *Cyprinus carpio*, the asteriscus (Pl. XXIX. fig. 28) is more elongated than in the preceding species. The outer side is heavily furrowed and the rims serrated, the furrows extending to the inner side. The dorsal rim is curved and extends forward to an angle above the antirostrum, the posterior rim is curved, and there is a sharp angle at its junction with the ventral. The ventral rim is much truncated, terminating in a small rostral process behind a median line drawn vertically through the otolith. The sulcus has the heavy crests usual in the Cyprinid type, the lower crest with a pointed dorsal process and a ventral angle. The lapillus (fig. 29) is small and irregular in shape, showing no resemblance to those of related species. The sagitta (fig. 30) has a prominent dorsal beak, above the middle of the otolith—there is no keel as in *Leuciscus cephalus* and *Barbus*.

In *Gobio gobio*, the asteriscus (Pl. XXIX. fig. 33) and lapillus are about equal in size, the asteriscus is nearly circular, and the sulcus is typically Cyprinid; there is a blunt antirostrum and a small rostrum; there is no projection, however, of the lower crest. The lapillus is bulbous at one end and flattened at the other, with a rounded projection at one side and on the other a little serrated wing; it shows little relation to the lapilli of related species. The sagitta is large in proportion, and rather stouter than in the preceding species.

In *Tinca tinca*, the asteriscus resembles *Gobio*, but is more ovate; there is no projection of the lower sulcal crest. The dorsal rim has a slight median point, there is a large antirostrum, but no rostrum or projection of the lower sulcal crest. The sulcus and crests are similar to *Gobio*. The lapillus shows considerable resemblance to that of *Leuciscus cephalus* in general conformation, and in its size relative to the asteriscus. The sagitta is unusually broad, and has two dorsal denticulations.

In the families Cobitidæ and Homalopteridæ, all the otoliths are microscopic. The lapillus is the largest, the asteriscus is next in importance, and the sagitta is small and thread-like.

In *Misgurnus anguillicaudatus* (fig. 31) the asteriscus is ovate and upright, the lapillus ovate, and the sagitta curved and attenuated, with the anterior end flattened when viewed laterally.

In *Nemachilus stoliczkæ* (fig. 32), the asteriscus resembles the Characid type, with a straight frontal rim as in *Pseudochalceus*—it is flat and without a rostrum. The lapillus (fig. 32) is much larger than the asteriscus, and is biconvex and pear-shaped. The sagitta is thread-like and negligible for comparative purposes.

In *Gastromyzon borneensis* (fig. 34), of the Homalopteridæ, the lapillus is the largest otolith and is somewhat similar to that of *Barilius* (fig. 17), which resembles the form presented by numerous species of the suborder Siluroidea.

EXPLANATION OF PLATE XXIX.

Otoliths of the Suborder Cyprinoidea.

Fig. 1. *Hoplias malabaricus* (asteriscus), × 2.
Fig. 2. —— —— (lapillus), × 2.
Fig. 3. —— —— (sagitta), × 2.
Fig. 4. *Alestes macrolepidotus* (asteriscus), × 4.
Fig. 5. *Hydrocyon forskalii* (asteriscus), × 5.
Fig. 6. *Gastropelecus stellatus* (asteriscus), × 6.
Fig. 7. *Pseudochalceus perstriatus* (asteriscus), × 5.
Fig. 8 *Chirodon alburnus* (asteriscus), × 5.
Fig. 9. *Curimatus dobula* (asteriscus), × 6.
Fig. 10. *Citharinus citharus* (asteriscus), × 2.
Fig. 11. *Ichthyoborus besse* (asteriscus), × 5.
Fig. 12. *Distichodus rostratus* (asteriscus), × 6.
Fig. 13. *Gymnotus carapo* (asteriscus), × 8.
Fig 14. *Sternopygus macrurus* (asteriscus), × 6.
Fig. 15 *Ictiobus cyprinella* (asteriscus), × 3½
Fig. 16. *Barilius alburnops* (asteriscus), × 4½.
Fig. 17. —— —— (lapillus).
Fig. 18. —— —— (sagitta).
Fig. 19. *Rutilus rutilus* (asteriscus), × 3.
Fig. 20. —— —— (lapillus), × 3.
Fig. 21. —— —— (sagitta), × 3.
Fig. 22. *Leuciscus cephalus* (asteriscus), × 3½.
Fig 23. —— —— (lapillus), × 3½.
Fig. 24. —— —— (sagitta), × 3½.
Fig 25. *Barbus barbus* (asteriscus), × 3½.
Fig. 26. —— —— (lapillus), × 3½.
Fig 27. —— —— (sagitta), × 3½.
Fig. 28. *Cyprinus carpio* (asteriscus), × 2¼.
Fig. 29. —— —— (lapillus), × 2¼.
Fig. 30. —— —— (sagitta), × 2¼.
Fig. 31. *Misgurnus anguillicaudatus*, × 6.
Fig. 32. *Nemachilus stoliczkæ*, × 7.
Fig. 33. *Gobio gobio* (asteriscus), × 5.
Fig. 34. *Gastromyzon borneensis* (lapillus), × 7.

SUMMARY.

1. In the Cyprinoidea the *asteriscus* is generally the principal otolith, exceptions being the families Cobitidæ an Homalopteridæ in which the *lapillus* is larger, the *sagitt* remaining small and attenuated in this suborder.

2. The typical form of the asteriscus in the Characiforme and Gymnotiformes is ovate, the dorsal rim more pointed than the ventral, the outer side flat with radiating furrows extending to serrations on the rims. The inner side flat or slightly convex, with the crests of the sulcus slight o absent. The sulcus has the upper and lower edges domed and turns downward to its termination near the centre o the otolith, while the front opens in the middle of t anterior rim.

3. The otoliths of the Citharinidæ differ from the foregoing type in the formation of the sulcus, which is broad and rounded at its termination, and in *Citharinus* is divided by a median constriction. The otolith in *Citharinus* is bi-convex with a heavy crest surrounding the sulcus, and resembles the form presented in the Catostomidæ, as exemplified in *Ictiobus*. *Distichodus* is exceptional in that the lower line of the sulcus is distended ventrally, and the sulcus is sac-shaped.

4. In the Cyprinidæ, the otoliths of *Barilius* present certain Characid features. They are very flat compared with those of the remainder of the family, and the lower line of the sulcus is domed as in the Characiformes. Another Characid feature is the position of the asteriscus in the cranial cavity. These points confirm Mr. Regan's contention that *Barilius* is the most primitive of living Cyprinoids *.

5. The otoliths of other species of the Cyprinidæ, while resembling the Characid type in certain features, such as the radiating furrows of the outer side and the serrated edges, are generally elongated and also differ in the shape of the sulcus, owing to the lower line being either straight or distended ventrally instead of being domed.

6. In the Cobitidæ and Homalopteridæ, the asteriscus, which throughout the remainder of the suborder appears to be invariably the largest of the three otoliths, gives place in importance to the lapillus, this feature occurring elsewhere only in the succeeding suborder, the Siluroidea.

I take this opportunity of acknowledging, with many thanks, the use of material kindly supplied by the British Museum (Nat. Hist.), and the great help which I have received from Mr. C. Tate Regan, F.R.S., and Mr. J. R. Norman of that institution.

LXII.—*New Ceratioid Fishes from the N. Atlantic, the Caribbean Sea, and the Gulf of Panama, collected by the 'Dana.'* By C. Tate Regan, M.A., F.R.S., Keeper of Zoology in the British Museum (Natural History).

The Ceratioid fishes collected by the 'Dana' have been sent to me by Dr. Johannes Schmidt. They include examples of eight new genera and twenty-four new species, two of which

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* Ann. & Mag. Nat. Hist. ser. 8, vol. viii. p. 13 (1911).

(*Photocorynus spiniceps* and *Edriolychnus schmidti*) have already been described (Proc. R. S., B, xcvii. 1925, p. 386). The new fishes belong to six families—Oneirodidæ, Linophrynidæ, Photocorynidæ, Melanocetidæ, Gigantactinidæ, and Aceratiidæ. The first three of these, here defined for the first time, may be distinguished as follows:—The Oneirodidæ (*Oneirodes*, *Dolopichthys*, *Lophodolus*, *Chænophryne*, *Lasiognathus*) are very near the Melanocetidæ, but have no foramen between lateral ethmoid and vomer; externally they differ from the Melanocetidæ in having the dorsal and anal fins subequal and in having 4 bifid caudal rays instead of 6. The Linophrynidæ (*Borophryne*, *Linophryne*, *Edriolychnus*, *Haplophryne*) differ from the Oneirodidæ in that the trough on the upper surface of the skull does not extend backwards to the epiotics, and in having an angular præoperculum, attached at its upper and lower ends only. *Photocorynus* approaches the Linophrynidæ in cranial structure, but has the præoperculum attached throughout its length. The Himantolophidæ (*Himantolophus* and *Diceratias*) differ from all these in the absence of the parietal bones.

1. *Dolopichthys luetkeni*, sp. n.

D. 6; A. 4. Illicium as in *Oneirodes eschrichtii*, which this species closely resembles, except for the absence of the isolated ray on the back.

Gulf of Panama.

One specimen, 160 mm. in total length.

This species is named in memory of the Danish zoologist C. F. Luetken, who greatly advanced the knowledge of oceanic fishes.

2. *Dolopichthys heteracanthus*, sp. n.

D. 5–7; A. 4–5. Two spines at articulation of lower jaw, the one borne by the quadrate longer than the mandibular. Teeth moderate, unequal. Illicium (exclusive of exserted basal) ⅙ to ⅕ length of fish.

Gulf of Panama.

Ten specimens, up to 65 mm. in total length.

3. *Dolopichthys anisacanthus*, sp. n.

D. 5–6; A. 4–5. Closely related to *D. heteracanthus*, but teeth fewer and stronger, 15 to 20 on each side in upper jaw, about half of them strong canines. Illicium ⅙ to ¼ length of fish.

N. Atlantic (Sts. 1152, 1165, 1183, 1256).

Four specimens; total length 43 mm.

4. *Dolopichthys microlophus*, sp. n.

D. 7; A. 5. Distinguished from the preceding by the shorter illicium, less than ⅒ the length of fish, and the much smaller and more numerous teeth, forming a close-set series in the upper jaw.

N. Atlantic (St. 1159).

One specimen; total length 34 mm.

5. *Dolopichthys gracilispinis*, sp. n.

D. 5; A. 5. Spines at articulation of lower jaw long, slender, divergent, the mandibular longer than that on the quadrate. Illicium ⅕ to ¼ length of fish.

N. Atlantic (St. 1358) and Gulf of Panama.

Two specimens, 50 and 65 mm. in total length.

6. *Lophodolus acanthognathus*, sp. n.

D. 8; A. 7. Similar to *L. indicus*, Lloyd, but with the illicium shorter and arising from between sphenotic spines instead of from occiput.

N. Atlantic (Sts. 1342, 1358).

Two specimens, 22 and 25 mm. in total length.

LASIOGNATHUS, gen. nov.

Near *Dolopichthys*, but upper jaw projecting far in advance of lower, and præmaxillaries connected with head by a wide membrane, which permits them to meet anteriorly either above the snout or below it; in the latter position they form the margin of a membranous pouch, with long and slender teeth meeting across the aperture in front of the lower jaw.

7. *Lasiognathus saccostoma*, sp. n.

D. 5; A. 4. Depth about 4 in length. Head compressed, very elongate, the slender sphenotic spines but little nearer to end of præmaxillaries than to base of caudal. At articulation of lower jaw mandibular and quadrate spines like those of *Dolopichthys gracilispinis*. Illicium about as long as the fully exserted basal bone, the two together as long as the fish; beyond the bulb a filament that ends in three hook-shaped denticles.

Caribbean Sea.

One specimen, 75 (60+15) mm. in total length.

CHÆNOPHRYNE, gen. nov.

As *Dolopichthys*, but without sphenotic spines and with posterior part of trough on upper surface of skull margined by blunt ridges.

8. *Chænophryne longiceps*, sp. n.

D. 7; A. 6. Head long, with decurved profile; lower jaw $\frac{1}{2}$ to $\frac{3}{5}$ length of fish.

N. Atlantic (Sts. 1152 and 1370) and Gulf of Panama.

Fourteen specimens, 15 to 30 mm. in total length.

BOROPHRYNE, gen. nov.

As *Linophryne*, but without a barbel.

9. *Borophryne apogon*, sp. n.

D. 4; A. 4; P. 15–16. Form oval, rather deep. Illicium with short stem; bulb with branched filaments at sides and with bifid terminal appendage.

Gulf of Panama.

Four specimens up to 83 mm. in total length.

10. *Linophryne macrodon*, sp. n.

D. 3; A. 3; P. 17. Illicium longer and more slender than in *L. lucifer*, with smaller bulb and longer terminal filament. Barbel $\frac{2}{3}$ length of fish, with a lateral and two terminal branches; each of the latter divides into two long filaments, each of which bears a shorter one.

Gulf of Panama.

One specimen, 53 mm. in total length.

11. *Linophryne arborifer*, sp. n.

D. 3; A. 3; P. 16. Illicium with trifid terminal appendage longer than stem + bulb. Barbel as long as fish, much branched, the ultimate branches filamentous.

N. Atlantic (St. 1161).

One specimen, 70 mm. in total length.

12. *Linophryne polypogon*, sp. n.

D. 3; A. 3; P. 12. Bulb of illicium with a series of filaments on each side. Barbel ½ length of fish, with about 16 equal branches arising together from the short basal part.

N. Atlantic (St. 1142).

One specimen, 45 mm. in total length.

13. *Melanocetus niger*, sp. n.

D. 14–15; A. 4; P. 18–20. Near *M. johnsoni*, but illicium shorter (⅓ to ⅜ length of fish) and teeth in jaws weaker; a strong tooth on each side of vomer.

Gulf of Panama.

Seven specimens; total length 110 mm.

14. *Melanocetus polyactis*, sp. n.

D. 16–17; A. 4; P. 19–20. Near *M. niger*, but dorsal rays more numerous, illicium ½ length of fish, reaching origin of dorsal when laid back, and vomerine teeth in a transverse series, as in *M. johnsoni*.

Gulf of Panama.

Three specimens; total length 90 mm.

15. *Gigantactis gracilicauda*, sp. n.

D. 6; A. 6. Illicium as long as fish. Origin of dorsal equidistant from eye and base of caudal. Caudal peduncle long and slender.

N. Atlantic (St. 1183).

One specimen, 107 mm. in total length.

16. *Gigantactis macronema*, sp. n.

D. 6; A. 5. Illicium four times as long as fish. Origin of dorsal a little nearer to base of caudal than to end of snout. Caudal peduncle long and slender.

N. Atlantic (St. 1365).

One specimen, 133 mm. in total length.

RHYNCHACTIS, gen. nov.

Near *Gigantactis*, but teeth in jaws minute, except for an external pair of anterior canines in upper jaw.

17. *Rhynchactis leptonema*, sp. n.

D. 3; A. 3. Head rather short and broad; illicium slender, 1½ length of fish, inserted above end of snout, which is truncated and does not project in front of mouth. Origin of dorsal equidistant from eye and base of caudal. Caudal peduncle slender.

N. Atlantic (St. 1171).

One specimen, 57 (42 + 15) mm. in total length.

LIPACTIS, gen. nov.

Related to *Aceratias*. No illicium. Skin blackish, spinulose. Snout short, not projecting. Teeth in jaws small. Eyes not telescopic. Nasal area not prominent.

18. *Lipactis tumidus*, sp. n.

D. 5; A. 4; P. 15. Form ovate, the depth about ½ the length. Mouth small, oblique.

N. Atlantic (Sts. 1171, 1186).

Two specimens; total length 35 mm.

RHYNCHOCERATIAS, gen. nov.

Near *Lipactis*, but snout projecting in front of præmaxillaries, armed with denticles that are opposed to the enlarged anterior teeth of lower jaw. Eyes not telescopic. Nasal area not or but little prominent.

19. *Rhynchoceratias brevirostris*, sp. n.

D. 5; A. 4. Rostral projection short. Nasal area pigmented; nostrils moderate, the anterior wide apart.

N. Atlantic (St. 1171). One specimen, 40 mm. in total length.

20. *Rhynchoceratias leucorhinus*, sp. n.

D. 4–5; A. 4. Rostral projection short. Nasal area white; nostrils large, the anterior narrowly separated in middle line of snout, the posterior contiguous to eyes.

N. Atlantic and Gulf of Panama.

Six specimens, up to 25 mm. in total length.

21. *Rhynchoceratias oncorhynchus*, sp. n.

D. 4–5; A. 4. Depth 3½ in length. Rostral projection prominent, decurved. Nasal area pigmented ; nostrils moderate, the posterior well separated from and smaller than eye.

N. Atlantic (Sts. 1171, 1189).

Two specimens ; total length 44 mm.

22. *Rhynchoceratias rostratus*, sp. n.

D. 5 ; A. 4. Depth 3 in length. Rostral projection prominent, decurved. Nasal area pigmented ; nostrils rather large, the posterior near eye and equal to eye in vertical diameter.

Gulf of Panama.

One specimen, 38 mm. in total length.

LXIII.—Spongilla rotundacuta, *a new Fresh-water Sponge from the Delta of the Volga*[*]. By P. Resvoi (Zoological Museum of the Russian Academy of Sciences).

The sponge is incrusting, forming a crust some 4 mm. thick. The main fibres of the skeleton arise vertically and the spicules project through the dermal membrane. The more light transverse fibres connect the main ones.

The gemmules gather on the substratum in a pavement-layer.

The macroscleres are smooth, cylindrical, and slightly curved. Most of them have rounded tips of a paraboloidal form, or they have points very obscurely and slightly marked. Sometimes each end bears a minute conical projection.

The microscleres are smooth, fusiform, gradually and sharply pointed, scattered in the parenchyma and piled up in great numbers round the gemmula-layer.

Each gemmula is surrounded with a cellular pneumatic coat and has a foraminal tubule.

This new sponge was found in the delta of the Volga (18. ix. 1922) and sent to me with other material from the Volga River by Mr. A. L. Behning.

The only specimen is a crust on a fragment of a *Unio* shell. Its colour is dark grey ; the flesh is rather hard and very brittle.

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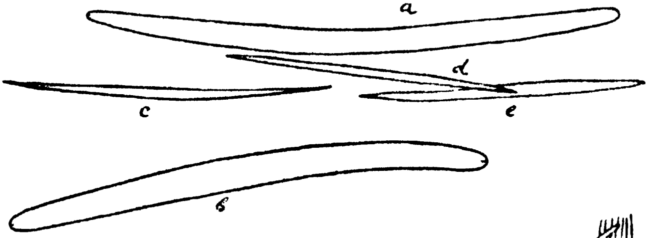
[*] Described but not figured in 'Arbeiten der Biologischen Wolga-Station,' Bd. vii. Nr. 1, 2 (1923) (Saratov).

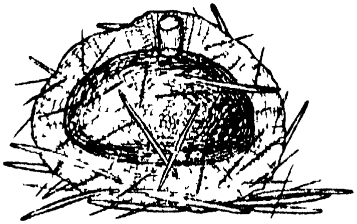
The thin dermal membrane, conserved in some places, is pierced with the projecting spicules.

The gemmules form a continuous pavement-layer of yellow colour.

The skeleton is formed of vertical main fibres and connecting transversal ones (fig. 2, *a*, *b*). The skeleton of the dermal membrane is an irregular network of macroscleres, indistinctly gathered in fibres. Between them occur microscleres.

Fig. 1.





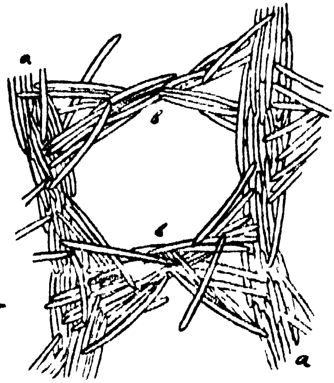


Fig. 3.

Fig. 2.

Fig. 1.—*a* and *b*, macroscleres; *c*, *d*, and *e*, microscleres.
Fig. 2.—The skeleton: *a*, main, and *b*, transversal fibres.
Fig. 3.—A gemmula.

The majority of the macroscleres have rounded ends (fig. 1, *a*, *b*); the indistinctly pointed spicules occur less in number. In addition, very rarely there are found spicules with distinctly short-pointed ends. The macroscleres are cylindrical, 265–220 mm. long and 17–13 mm. thick.

The microscleres are fusiform, 144–117 mm. long and 7–4 mm. thick (fig. 1, *c*, *d*, and *e*). Gradually tapering away to both ends, they terminate with thin points.

The macro- and microscleres are connected by transitory forms, but the latter occur rarely. Both groups are therefore quite distinct.

The gemmules have ·428–275 mm. in diameter and form a pavement-layer on the surface of the shell. The side of each gemmula, pressed to the substratum, is flattened, and that gives them a peculiar appearance (fig. 3).

From the top of each gemmula arises tubule, 78–80 mm. long and 50–40 mm. wide, which pierces the cellular pneumatic coat.

The microscleres are gathered in great numbers around the gemmula-layer.

S rotundacuta refers to a group of the genus which has smooth microscleres. In the literature accessible to me there are four of such species described. These are the following: *S. sinensis*, Annandale, *S. aspinosa*, Potts, *S. ætheriæ*, Annandale, and *S. carteri*, Bowerbank.

In *S. sinensis* the gemmules are deprived of the tubules. In *S. aspinosa* occur dermal microscleres of a peculiar kind. Those peculiarities separate both species from *S. rotundacuta*. This latter is nearly allied to both remaining species, *S. ætheriæ* and *S. carteri*, which are possibly identical.

S. rotundacuta is related to *S. carteri*, as *S. fragilis*, subsp. *calcutana*, Annandale, to the typical form. In this subspecies the macroscleres "are abruptly pointed or almost rounded at the tips"*. In our case the diversity goes in the same direction.

S. carteri is "the most universally distributed" species in India†. It is found in the Malay Archipelago and on Mauritius. Quite apart stands the finding of this species in Europe, in the Balaton Lake (subsp. *balatonensis*, Arndt‡).

S. ætheriæ is known from Africa.

The near relationship between our form and these tropical species makes us regard our species as a southern element of the fauna. Its finding in the delta of the Volga must be in connection with the occurrence here of some southern elements also in the flora.

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* Annandale, 1911, 'The Fauna of British India,' London, p. 96.

† *L. c.* p. 90.

‡ Annandale, *l. c.* p. 89; W. Arndt, 1923, Zool. Anz. Bd. lvi. Heft 3-4, "In der Beschaffenheit der Spicula und der Gemmulæ unterschieden sich die vorliegenden Exemplare nicht von denen der Stammform," p. 78.

LXIV.—*Two new Fishes from Tonkin, with Notes on the Siluroid Genera* Glyptosternum, Exostoma, *etc.* By J. R. Norman.

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THE new species described below form part of a small collection of fishes made by Mr. H. Stevens, under the direction of the Trustees of the Percy Sladen Trust and the Godman Exploration Fund, in the basin of the Red River, Northern Tonkin.

Discognathus apogon, sp. n.

Depth of body 5 to 5¼ in the length, length of head 4¾ to 5. Snout rounded, equal to or a little longer than postorbital part of head; diameter of eye 4⅔ to 5 in length of head; interorbital region a little convex, its width 2 to 2¼ in length of head. Width of mouth more than ⅔ that of head; barbels absent. Central area of disc about ⅓ its total width; free border with numerous small papillæ. Upper lip feebly papillose, with crenulated margin. Dorsal III 8; a little nearer base of caudal than end of snout; second branched ray longest, as long as or a little shorter than head. Anal II 5. Pectoral shorter than head, extending more than ½ of distance from its base to pelvics, which reach vent or a little beyond. Caudal deeply emarginate. Caudal peduncle about twice as long as deep. 40–42 scales in a longitudinal series, 5 from origin of dorsal to lateral line, 3 between lateral line and root of pelvic. Dark brown above, yellowish white below; some dark streaks on upper parts of dorsal rays.

Four specimens, 115–123 mm. in total length, from Ngoi-Tio, Col des Nuages, Tonkin (altitude 4500–6500 feet).

Near *D. imberbis*, Vinciguerra, from Burma, which has a larger head, longer snout, shorter postorbital region, central area of disc more than ½ its total width, and pectorals extending well beyond vent. It may be distinguished from *D. prochilus*, Sauvage, from Sze Chuen, China, chiefly by the complete absence of barbels.

Euchiloglanis macrotrema, sp. n.

Depth of body 8 to 9 in the length, length of head 4¾ to 5⅓. Head about as broad as long. Eyes very small; interorbital width nearly 4 in length of head. Snout longer than postorbital part of head. Nasal barbel $3\frac{3}{5}$ to $3\frac{3}{4}$ in length of head, nearly or quite reaching eye; maxillary barbel reaching level of upper angle of gill-opening; outer mandibular barbel longer than inner, somewhat shorter then nasal barbel. Fold of lower lip interrupted. Width of mouth about $2\frac{1}{4}$ in length of head. Lower angle of gill-opening opposite lower end of pectoral base. Dorsal I 6; origin a little in front of extremity of pectoral, equidistant from upper end of pectoral base and middle of pelvic base. Anal 6. Pectoral with 16 branched rays, a little longer than head, not reaching pelvics. Pelvic with 5 branched rays, nearly or quite reaching vent. Caudal truncate. Caudal peduncle $2\frac{1}{2}$ to $3\frac{1}{4}$ times as long as deep.

Two specimens, 110 and 170 mm. in total length, from Ngoi-Tio, Col des Nuages, Tonkin (altitude 4500–6500 feet).

Near *E. feæ*, Vinciguerra, from Upper Burma, differing especially in the larger gill-openings and the more slender caudal peduncle.

Mr. Regan * has grouped the fishes formerly placed in the genus *Exostoma* of Blyth into three genera—*Parexostoma*, *Euchiloglanis*, and *Exostoma*,—based mainly on differences in the dentition. The types of *Exostoma andersonii*, Day—a species not seen by Regan,—have been redescribed by Hora †; this species appears to me to be sufficiently distinct from the remainder to warrant the erection of a fourth genus for it. These four genera appear to be well defined, and I adhere to the nomenclature of Regan. Hora has proposed to transfer the name *Glyptosternum* to the group collectively, but his reason for this—that McClelland's description of the pectoral fin of *G. reticulatum* indicates the structure found in these four genera and in *Pseudecheneis*—seems to me insufficient. He also considered *Exostoma* to be a synonym of *Glyptothorax*, but, as Regan ‡ has pointed out, Blyth's description of the genus leaves no doubt that he had before him a fish congeneric with *Exostoma labiatum*. The assumption that the corrugated thorax described by McClelland in *Glyptosternum reticulatum*, and the absence of folds on the thorax of *Exostoma* as described by Blyth, are both the result of preservation in spirit, seems a somewhat insufficient reason for interchanging these generic names.

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* Ann. & Mag. Nat. Hist. (7) xv. 1905, p. 182.

† Rec. Ind. Mus. xxv. 1923, p. 1.

‡ Ann. & Mag. Nat. Hist. (9) vi. 1923, p. 608.

The following synopsis is based on that given by Regan, but has been modified to include all the species now known:—

I. Teeth all pointed, those of the upper jaw forming a band which is produced backwards at the sides (figs. 1 A, 2 A); gill-openings extending on to the lower surface of the body; fold of lower lip broadly interrupted; pectoral with 11 branched rays .... PAREXOSTOMA, Regan.

  A. Pectoral extending ⅗–¾ of the distance from its base to the base of pelvics; caudal peduncle 3 times as long as deep .... 1. *P. stoliczkæ*, Day [= *P. oschanini*, Herz.] †.

  B. Pectoral extending ½–⅗ of the distance from its base to the base of pelvics; caudal peduncle twice as long as deep. 2. *P. maculatum*, Regan.

II. Teeth all pointed, those of the upper jaw forming a band, which is not produced backwards at the sides (figs. 1 B, 1 C); gill-openings not extending on to the lower surface of the body; lower lip continuous or not; pectoral with 13–19 branched rays .... EUCHILOGLANIS, Regan [= CHIMARRHICHTHYS, Sauvage].

  A. Fold of lower lip interrupted; pectoral with 13–17 branched rays.

    1. Lower angle of gill-opening above base of pectoral spine.

      a. Pectoral fin extending scarcely ⅔ of the distance from its base to base of pelvics; band of teeth in upper jaw partially divided in the centre (fig. 1 C); pectoral with 15 branched rays .... 1. *E. feæ*, Vinciguerra.

      b. Pectoral fin extending ¾ or more of the distance from its base to base of pelvics; band of teeth in upper jaw not divided.

        *. Pectoral with 13–15 branched rays; caudal peduncle much longer than deep.

          †. Width of mouth 2½ to 3 in length of head; caudal peduncle 2 to 2⅖ times as long as deep .... 2. *E. davidi*, Sauvage.

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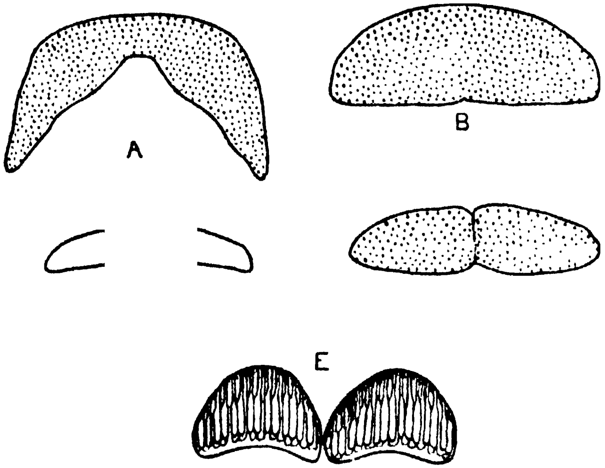
† This species is found in Eastern Turkestan and in the mountain-regions that border it on the south and west. I have compared an example from Kashmir, undoubtedly *P. stoliczkæ*, with others from the Ak Sai River, Eastern Turkestan, and the Upper Amu-Daria, received as *P. oschanini*, and am unable to detect any important differences between them.

††. Width of mouth 2 to $2\frac{1}{3}$ in length of head; caudal peduncle 3 times as long as deep. 3. *E. myzostoma*, Norman.

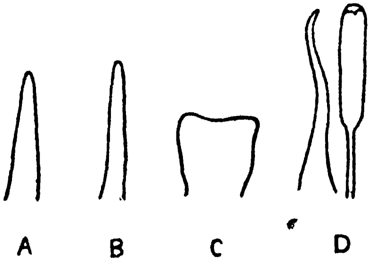
**. Pectoral with 16–17 branched

Fig. 1.



Dentition of upper jaw of: (A) *Parexostoma stoliczkæ*, (B) *Euchiloglanis davidi*, (C) *E. feæ*, (D) *Glaridoglanis andersonii* (after Hora), (E) *Exostoma vinciguerræ*.

Fig. 2.



Isolated tooth of: (A) *Parexostoma stoliczkæ*, (B) *Euchiloglanis davidi*, (C) *Glaridoglanis andersonii* (after Hora), (D) *Exostoma vinciguerræ*.

rays; caudal peduncle about as long as deep .... 4. ***E. hodgarti***, Hora.

2. Lower angle of gill-opening opposite base of pectoral spine .... 5. ***E. macrotrema***, Norman.

- B. Fold of lower lip continuous; pectoral with 16-19 branched rays.
  - 1. Pectoral with 19 branched rays, extending beyond origin of pelvics .. 6. *E. macropterus*, Vinciguerra.
  - 2. Pectoral with 16 or 17 branched rays, not extending beyond origin of pelvics .... 7. *E. blythii*, Day.

III. Teeth greatly compressed, with apices broad, truncate or notched, those of the upper jaw forming a band which is not produced backwards at the sides (figs. 1 D, 2 C); gill-openings not extending on to the lower surface of the body; fold of the lower lip broadly interrupted; pectoral with 11 branched rays..... .. GLARIDOGLANIS, gen. nov.
1. *G. andersonii*, Day.

IV. Teeth rather large, movable, oar-shaped, flattened distally (fig. 2 D), depressed and directed backwards, arranged in two well-separated bands or patches in each jaw (fig. 1 E); gill-openings not extending on to the lower surface of the body; fold of the lower lip continuous; pectoral with 10-12 branched rays .. EXOSTOMA, Blyth.

- A. Caudal fin truncate or very slightly emarginate . ... 1. *E. vinciguerræ*, Regan [incl. *E. stuarti*, Hora, and *E. chaudhurii*, Hora].
- B. Caudal fin forked or rather deeply emarginate.
  - 1. Pectoral with 10 branched rays .... 2. *E. berdmorii*, Blyth.
  - 2. Pectoral with 12 branched rays .... 3. *E. labiatum*, MacClell.

The following species requires a new description:—

Euchiloglanis davidi.

Chimarrichthys davidi, Sauvage, Rev. et Mag. Zool. xxv. 1874, p. 333; Regan, Ann. & Mag. Nat. Hist. (7) xv. 1905, p. 183.
Exostoma davidi, Gunther, in Pratt, Snows of Thibet, Appendix, p. 245 (1892).
Glyptosternum davidi, Hora, Rec. Indian Mus. xxv. 1923, p. 37.

Depth of body 5 to 6½ in the length, length of head 4⅙ to 4⅗. Head about as broad as long. Eyes very small; interorbital width 3½ to 3⅘ in length of head. Snout about as long as postorbital part of head. Nasal barbel 3⅗ to 3½ in length of head, reaching eye; maxillary barbel short, scarcely reaching beyond lower end of pectoral base; outer mandibular barbel longer than inner, but shorter than nasal barbel. Fold of lower lip widely interrupted. Width of mouth 2½ to 3 in length of head. Lower angle of gill-opening opposite or below the middle of pectoral base. Dorsal I 6; origin above posterior half of pectoral, equidistant from upper angle of gill-opening and middle of pelvic base. Anal 6. Pectoral with 13 or 14 branched rays, a little longer than head, scarcely reaching pelvics. Pelvic with 5 branched rays, almost reaching vent. Caudal subtruncate. Caudal peduncle 2 to 2⅔ times as long as deep. Uniform pale brownish.

Eastern Tibet.

Described from five specimens, 125–155 mm. in total length, including one of the types of the species.

LXV.—*The Spedan Lewis South American Exploration.*— I. *On Mammals from Southern Bolivia.* By OLDFIELD THOMAS, F.R.S.

By the generosity and public spirit of Mr. J. Spedan Lewis, the successful collector Señor Emilio Budin has been enabled to continue his collecting work in South America for the benefit of our National Museum. Such a continuation is of the utmost value to science and to the Museum, for the localities at which Sr. Budin has previously worked are isolated from each other, and we really know very little of the detailed distribution of the various forms, and how far they intergrade.

The present collection, the first on Mr. Lewis's account, was made in extreme Southern Bolivia, in the country bordering Northern Argentina. No other modern collectors have worked in this area, although Perry O. Simons got series from the high plateau to the west, Robin Kemp some from Cordova, William Foster from Paraguay, and Alphonse Robert from Matto Grosso. But the Southern Bolivian lowlands have not previously been investigated.

A few specimens in spirit were, however, collected by Dr. Borelli for the Turin Museum in 1897 at Caiza in this same region, and were worked out by myself *.

The localities at which this first collection was made are as follows:—

Yacuiba.—Just on the Bolivian side of the Argentine-Bolivian boundary, about 22° S. and 6° 30′ W. Altitude 600 m.

Carapari.—1000 m., about 35 kilometres north of Yacuiba, on the way towards Tarija, Bolivia. "A low-lying valley, with a great deal of vegetation."

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* Bull. Mus. Torino, xiii. no. 315 (1898).

Sierra Santa Rosa.—A range of hills near Itau, about 75 kilometres N.W. of Yacuiba and 40 kilometres west of Carapari. Summit about 2200 metres; one of a series of parallel ranges which have to be crossed in travelling northwards into Bolivia. The locality where Sr. Budin worked was at the foot of the range, altitude about 1600 m.

The collection consists of seventy-nine specimens belonging to nineteen species, of which the majority are related, as is natural, to those of Jujuy, N. Argentina, a province whose mammalogy is alone known from the previous work of the same admirable collector *. There are, however, several forms belonging to a more northern fauna, among which may be noted the new tree-rat (*Rhipidomys collinus*) and the large coludo which I have called *Oryzomys legatus*. Of the new discoveries the most notable is the handsome brocket named after Mrs. Lewis.

Even from this first collection it is clear that very much of interest and value to science is certain to result from whatever explorations Sr. Budin is enabled to make by Mr. Lewis's help.

1. *Cebus azaræ*, Rengg.

♀. 1754. Yacuiba, 600 m.

♀. 1791. Carapari, 1000 m.

♀. 1823. Sierra Santa Rosa, 1000 m.

Represents *C. pallidus*, Gray, which is by Elliot considered as a subspecies of *azaræ*. The typical specimen of *pallidus* came from Santa Cruz de la Sierra, and the present is a considerable extension of its known Bolivian range.

2. *Eptesicus* sp.

♂. 7 A. Sierra Santa Rosa.

Near *E. furinalis*, d'Orb. Forearm 38 mm.

3. *Myotis nigricans*, Wied.

♀. 1773. Carapari, 1000 m.

4. *Cerdocyon mimax*, Thos.

♀. 1751, 1753, 1755. Yacuiba, 600 m.

♂. 1765, 1771, 1787; ♀. 1774, 1775, 1782, 1795, 1809. Carapari, 1000 m.

♂. 1813. Sierra Santa Rosa, 1600 m.

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* *Cf.* Ann. & Mag. Nat. Hist. (9) viii. p. 608 (1921).

This fine series shows that there is a good deal of variation both in colour and skull-characters in the genus *Cerdocyon*, some of them being nearly as dark-coloured as the type of *mimax*, while the majority are almost or quite as light as in that of *tucumanus*. In size their average is about equal to the dimensions in *mimax*, falling considerably short of that given by Lönnberg for his *Cerdocyon thous fronto* *, which came from the Rio de Oro, Chaco Austral.

Pending further study, the Bolivian specimens may be provisionally referred to *mimax*.

5. *Sciurus argentinius*, Thos.

♂. 1817, 1819, 1820, 1821, 1822; ♀. 1818. Sierra Santa Rosa, Itau, 1000 m.

Quite similar to the typical specimens, which were obtained by Sr. Budin at Higuerilla, Jujuy, in 1921.

6. *Oryzomys legatus*, sp. n.

♂. 1777, 1796. Carapari, 1000 m.

Near *O. intermedius* of S. Brazil.

General external appearance quite as in specimens from São Paulo of *O. intermedius* and of *O. boliviæ* of North Bolivia, the upper surface of the same dark-lined buffy, with brighter buffy sides and white belly, the hairs of which are grey basally. Ears large, brown. Hands and feet white. Tail long, finely scaly, brown above, lighter below, especially proximally, but not sharply bicolor.

Skull very like that of *O intermedius*. Zygomata more spread out behind, instead of being evenly curved outwards. Nasals less pointed behind. Interorbital region broader. Palatal foramina rather shorter. Incisors unusually opisthodont; angle of type 61°.

Dimensions of the type:—

Head and body 140 mm.; tail 164; hind foot 33·5; ear 25.

Skull: greatest length 36·5; condylo-incisive length 32·5; zygomatic breadth 18·5, nasals 14·6; interorbital breadth 6; palatal foramina 5·6; upper molar series 5·2.

Hab. as above.

Type. Adult male. B.M. no. 25. 2. 1. 24. Original number 1777. Collected 6th August, 1924.

This appears to be the furthest south recorded, in the western half of S. America, of any of these large species of

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* Ark. f. Zool. xii. p. 13 (1919).

Oryzomys, the animal seeming to be a representative in S. Bolivia of the Brazilian *O. intermedius*. In N. Bolivia there is already an ally of that animal—*O. boliviæ*,—but the present form is even more like *intermedius*, from which, however, it differs by the different curvature of its zygomata, and, chiefly, by its broader interorbital region, this being in *boliviæ* quite the same as in the Brazilian species.

7. *Oryzomys* sp.; *flavescens* group.

♂. 1749; ♀. 1747, 1748. Yacuiba, 600 m.

♂. 1768, 1781, 1786, 1802, 1805; ♀. 1767, 1770, 1799, 1801, 1806. Carapari, 1000 m.

8. *Rhipidomys collinus*, sp. n.

♂. 1824. Sierra Santa Rosa, 1000 m. 22nd September, 1924. B.M. no. 25. 2. 1. 39. *Type*.

A pale species allied to *R. austrinus*, but smaller.

Size medium. Fur not very long, hairs of back about 8 mm. in length. General colour above dull lined clay-colour, rather paler than in *austrinus*. Sides paler and rather more buffy. Under surface dull whitish, not very sharply defined laterally, the hairs broadly slaty at base, except on the chin and throat, where they are wholly white. Ears dark brown. Hands and feet with the median part of the metapodials brown, the edges and the digits white. Tail well haired, dark brown, the extreme base only furry like the body.

Skull as in *R. austrinus*, but smaller throughout.

Dimensions of the type:—

Head and body 135 mm.; tail 167; hind foot 29; ear 21.

Skull: greatest length 33·7; condylo-incisive length 31·5; zygomatic breadth 18; nasals 12; interorbital breadth 5; palatal foramina 7 × 3·4; upper molar series 5·7.

Hab. and *type* as above.

This is the first *Rhipidomys* found in Southern Bolivia. As is natural, it would seem to be allied to the Jujuy *R. austrinus*, but is readily distinguishable by its much smaller size.

"Trapped in a tree."—*E. B.*

9. *Hesperomys venustus*, Thos.

♂. 1746, 1750; ♀. 1758. Yacuiba, 600 m.

♂. 1764, 1780, 1783, 1803; ♀. 1788, 1808. Carapari, 1000 m.

The most northern locality recorded, the hitherto-known range extending from Jujuy southwards to Cordova.

10. *Akodon lenguarum*, Thos.

♀. 1797, 1798. Carapari, 1000 m.

Readily distinguishable from the next species by its pro-odont incisors, in which respect it agrees with *A. obscurus* and *benefactus*. The buffy-washed *A. lacteus* and *orbus* also have this character, and no doubt belong to the same group.

11. *Akodon varius*, Thos.

♂. 1760, 1762. Carapari, 1000 m.

Chin white. Sides of shoulders buffy as in true *varius*, not more greyish as in *glaucinus* and *simulator*. It has been previously suggested * that the two latter should probably be looked upon as subspecies of *varius*.

12. *Akodon sylvanus pervalens*, subsp. n.

♂. 1759; ♀. 1763. Carapari, 1000 m.

Like *A. sylvanus* of Jujuy in all essential respects, but larger, with longer tail, and the colour inconspicuously less obscure. Skull larger, heavier throughout, with broader interorbital region, longer brain-case, and slightly larger bullæ.

Dimensions of the type:—

Head and body 116 mm.; tail 93; hind foot 24·6; ear 19·4.

Skull: greatest length 30; condylo-incisive length 28; zygomatic breadth 16; nasals 12·3; interorbital breadth 5·2; brain-case, length 13·5, breadth 12·8; palatal foramina 7·6; upper molar series 4·7.

Hab. as above.

Type. Adult male. B.M. no. 21. 2. 1. 55. Original number 1759. Collected 22nd July, 1924.

Very similar to its Jujuy relative, but larger and heavier throughout. There is also a resemblance to the Paraguay *A. arviculoides montensis*, but the colour is darker, the teeth larger, and there is no trace of the supraorbital ridges and projections usually found in that form.

13. *Akodon cœnosus*, Thos.

♂. 1779, 1784, 1789, 1800; ♀. 1804. Carapari, 1000 m.

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* Ann. & Mag. Nat. Hist. (9) iii. p. 117 (1919).

14. *Oxymycterus paramensis jacentior*, subsp. n.

♂. 1772, 1778. Carapari, 1000 m.

General characters essentially as in true *paramensis*, with the same dark greyish black-lined head and anterior back, and dark buffy or ochraceous suffused rump, but the whole animal is of a somewhat paler shade, as though an inhabitant of a more desiccated area, and the fur is thinner, coarser, and shorter. Size slightly larger. Under surface similarly soiled greyish washed with dull buffy.

Skull rather larger and heavier than that of *paramensis*, the muzzle stouter, the nasals broader and less obviously trumpet-shaped anteriorly, though they are slightly *retroussés*. Zygomatic plate broader. Bullæ inconspicuously larger.

Dimensions of the type:—

Head and body 146 mm.; tail 119; hind foot 28; ear 19·8.

Skull: greatest length 36·2; condylo-incisive length 32·6; zygomatic breadth 16·8; nasals 14 × 4·3; interorbital breadth 6; palatal foramina 7·5; upper molar series 5.

Hab. as above.

Type. Old male. B.M. no. 25. 2. 1. Original number 1772. Collected 2nd August, 1924.

Since *O. paramensis* was described in 1902 further specimens of it have come in from Ollontaytambo, Cuzco region of Peru, and Leon, Jujuy, N. Argentina, but, in spite of the great distance between these localities, I can find no reason for distinguishing them from each other or from *paramensis* itself. The present specimens, however, from a lower altitude, show enough difference both in skin and skull to make advisable their subspecific separation.

15. *Ctenomys sylvanus*, Thos.

♀. 1757. Carapari, 1000 m.

Typical locality Tartagal, Salta.

16. *Cavia tschudii pallidior*, Thos.

♂. 1810, 1812, 1816; ♀. 1811, 1814, 1815. Sierra Santa Rosa, 1600 m.

Absolutely like the Arequipa cavy, in spite of the considerable distance separating the two localities.

The furthest southern record of the genus *Cavia* on the western side of South America, while on the east it extends to Ajó, Buenos Ayres.

17. *Sylvilagus brasiliensis gibsoni*, Thos.

♂. 1769, 1776. Carapari, 1000 m.

First described from Vermejo, Salta, and since received from Villa Carolina, Jujuy.

18. *Mazama saræ*, sp. n.

♀. 1790. Carapari, 1000 m. Adult in the prime of life, the teeth in full use but not worn down. B.M. no. 25. 2. 1. 77. *Type.*

A shaggy-haired red species of the *rufa* group, with the head and neck strongly contrasted deer-colour, not rufous.

Size about as in *rufa*. Fur shaggy, longer than in other members of the group. Nape-hairs reversed along middle line. General colour of body rich reddish, but the head and neck a clear *Odocoileus*-like grey, near drab-grey of Ridgway, contrasting markedly and almost abruptly with the body-colour, quite unlike the paler or browner edition of the body-red found in the other species. Top of muzzle blackish, with a white patch on the upper lip. Forehead between eyes and a small band below each eye pale rufous. Ears large, their proectote dark drab-grey, their metentote white. Rest of head and whole of neck drab-grey, slightly darker above and inconspicuously paler below, the interramia more whitish. Body throughout rich rufous, not turning to brown on the hips or lower limbs, which are wholly rufous; chest and belly rufous, inguinal region whitish. Tail short, its hairs mixed rufous and white.

Skull of type unfortunately with the muzzle broken off; its size and general shape about as in the type of *M. sheila*; suborbital pits shallow; length of tooth-row intermediate between those of Lönnberg's *M. rufa toba* and *M. r. rosii*.

Dimensions of the type:—

Head and body 1020 mm.; tail 99; hind foot, s. u. 243, c. u. 290; ear 105.

Skull: zygomatic breadth 83; breadth of brain-case 58·5; base of lateral palatal notches to back of condyle 74·5; upper tooth-series 58; molars only 33·5.

Hab. and *type* as above.

"Inhabits the stony hills."—*E. B.*

This handsome deer is distinguishable by its contrasted grey head and neck, all the other forms of the group having these either reddish or brownish, duller or paler than the body, and generally passing gradually into the colour of the shoulders, not abruptly different. Neither of the two deer described from the Chaco by Prof. Lönnberg* can be identified with it.

It is with great pleasure that I take the opportunity of naming this handsome animal (a most noteworthy discovery) in honour of Mrs. Spedan Lewis, to whose husband's generosity our National Museum is indebted for the continuation of Sr. Budin's valuable collecting work—work from which so much benefit has already resulted, and is likely to be productive of more.

19. *Marmosa elegans cinderella*, Thos.

♂. 1785, 1793, 1807; ♀. 1766, 1791. Carapari, 1000 m.

LXVI.—*On some Argentine Mammals.*
By Oldfield Thomas.

I. Two new Rodents from Tucuman Province.

In company with the remarkable new cavy, *Nanocavia shiptoni*, described in a previous number of the 'Annals,' Mr. Shipton presented to the National Museum a considerable number of other mammals, and among these there occur examples of the two following new rodents:—

Abrothrix illutea, sp. n.

A uniformly dull grey-brown species with very fine soft fur.

Size medium. Fur exceedingly fine and soft, hairs of back about 11 mm. in length. General colour above uniform finely ticked dark grey-brown (a little darker than "hair-brown"), quite without the buffy suffusion on the back found in the other species, the head and whole of the back of the same brownish tint; sides slightly lighter; under surface considerably lighter, the hairs washed with dull whitish; throat lighter and chin white to the bases of the hairs. Hands and feet dull whitish. Tail blackish throughout, below as well as above, except just for the basal inch.

Skull larger than that of *A. hirta*, smaller than in *longipilis*; smoothly rounded and without ridges, as usual in this genus. Muzzle not specially elongated, nasals of average proportions. Zygomatic plate rather narrow. Palatal foramina large and open, reaching nearly to the level of the middle of m^1.

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* Ark. f. Zool. xii. no. 10 (1919).

Dimensions of the type:—

Head and body 122 mm.; tail 78; hind foot 26; ear 16.

Skull: greatest length 30; condylo-incisive length 27·6; zygomatic breadth 14; nasals 11 × 4; interorbital breadth 48; breadth of brain-case 13·5; zygomatic plate 1·9; palatilar length 12·5; palatal foramina 7·5; upper molar series 4·5.

Hab. Tucuman Province. Type from Concepcion, 400 m.

Type. Adult female. B.M. no. 25. 3. 1. 13. Original number 71. Collected 9th September, 1918, and presented by S. Shipton, Esq. One specimen.

This woolly vole-mouse represents a considerable northward extension of the known range of the genus, the most northern localities hitherto known being Central Chili for *longipilis* and San Rafael, Mendoza, for *hirta*, while the other species are from the far south. It may be readily recognized by its uniform dull greyish-brown colour, without buffy suffusion, and its intermediate size.

Ctenomys tuconax, sp. n.

A very large chestnut-coloured species.

Size as in the largest members of the genus. Fur of medium length, rather thin and poor. General colour above uniform dark chestnut (near "argus-brown" or "auburn" of Ridgway), very much as in *C. sylvanus utililis*, rather warmer and redder than in *C. knighti*, median line of back not darkened. Under surface similar but paler, in some specimens approaching cinnamon; axillary white patches very rarely present. Head like body, without special markings, or the top of the muzzle may be a little darker while the chin may be paler. Hands and feet thinly haired, dull whitish. Tail pale brown.

Skull very large, falling but little short of that of *C. boliviensis*, and just about equal to that of large specimens of *opimus*, which it most resembles in shape. Upper surface more convex, the supraorbital edges and processes, although well developed, not raised to a higher level than the middle line of the skull. Nasals of medium size, not markedly narrowed posteriorly. Zygomata robust, not specially expanded laterally, the zygomatic nearly the same as the bimeatal breadth. Postorbital process of jugal of average size, a small and shallow but fairly well-defined fossa on the surface of the bone in front of it. Lambdoid crest well developed, sharply defined, and projected forward mesially, then backward and again forward laterally, so as to form a distinct **W** across the skull, much as in *knighti*, while in *opimus* the line is nearly directly transverse. Choanæ narrow, angular, about level with the posterior third of m^1. Bullæ not specially developed, rather less inflated than in *opimus*.

Incisors broad and heavy, a little proodont, their angle about 107°. Cheek-teeth powerful, the anterior proportionally large.

Dimensions of the type:—

Head and body 150 mm.; tail 80; hind foot 38.

Skull: length in middle line 54; condylo-incisive length 54·5; zygomatic breadth 35; nasals 20 × 8·7; interorbital breadth 14·5; between tips of postorbital processes 16·8; across brain-case 20·6; bi-meatal breadth 32·7; palatilar length 26; upper tooth-series (crowns) 12; oblique diameter of p^4 5·1.

Hab. Tucuman Province; typical series from Concepcion, 500 m.

Type. Adult male. B.M. no. 25. 3. 1. 17. Original number 8. Collected 23rd August, 1916. Six specimens.

"Trapped in the sugar plantation."

This fine and striking species is a rather unexpected discovery, as the tuco-tucos of this region were supposed to be fairly well known. It is readily recognizable by its great size, being far larger than *C. tucumanus* and others of this neighbourhood, and is, indeed, but little surpassed by *C. boliviensis*. From the *C. opimus* of the Bolivian plateau, which it most resembles in skull-characters, it is distinguished by its uniform chestnut-colour, widely different from that of the pale Bolivian animal.

II. A SPECIAL GENUS FOR *EUNEOMYS FOSSOR*.

When in 1899 [*] a long-clawed Salta rat was described as *Reithrodon fossor* it was stated that it "bore to the other Reithrodons precisely the relation that *Akodon megalonyx* and *macronyx* [since separated as *Chelemys*] did to the other Akodons, being similarly more highly specialized by the great development of its claws for a fossorial life."

But when in 1916 [†] this group of Murines was re-arranged, the parallel was not properly appreciated, and the species was placed in *Euneomys*, s. s., in company with *chinchilloides* and *mordax*.

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[*] Ann. & Mag. Nat. Hist. (7) iv. p. 280.

[†] *Op. cit.* (8) xvii. p. 142.

It is, however, so obviously distinct from them by its specialized habits and fossorial claws that I now think it should in the same way be separated as the basis of a peculiar genus, which might be termed *Chelemyscus*. Its primary characters would be the deeply grooved incisors and large fossorial fore-claws. The former separate it from *Chelemys*, and the latter from what appears to be its nearest ally, *Euneomys*.

III. A SECOND SPECIES OF *SPALACOPUS*.

Besides the fine series of *Spalacopus cyanus* which the Museum owes to Mr. J. A. Wolffsohn, and the few examples obtained by Mr. Bridges, it possesses one from South Chili which a comparison of the skulls shows to represent a distinct and much larger species.

It may be called

Spalacopus tabanus, sp. n.

Similar throughout to *S. cyanus*, but decidedly larger, as indicated by the skull-measurements. Colour, as usual, black with large irregular white pectoral and inguinal patches. Skull more robust in all respects, though the interorbital breadth is not greater, and is therefore less in proportion. Incisors rather more proodont—index 126°, as compared with about 115°.

Dimensions of the type (measured on the moistened skin):—

Head and body 145 mm.; tail 43; hind foot 29; ear 9.

Skull: condylo-basal length 42 (37·3)*; condylo-incisive length 44 (39); zygomatic breadth 27 (25); nasals 14·2 (12·2); interorbital breadth 8·8 (8·6); bi-meatal breadth 19 (18); breadth between outer corners of anteorbital foramina 19·4 (18·2); diagonal length of bullæ 12 (10·3); upper tooth-series (crowns) 8 (7·3).

Hab. South Chili (exact locality not known).

Type. Adult male. B.M. no. 73. 12. 16. 4. Purchased of E. Gerrard from a collection received from Dr. R. A. Philippi.

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* Measurements placed in parentheses are those of an old male of *S. cyanus* from the Coast Hills, Valparaiso.

All the members of this genus from Middle Chili, Valparaiso, &c., are of a quite uniform size, the skull of an old male with well-developed sagittal crest presenting the dimensions placed in parentheses above. With this those of *Spalacopus poeppigi*, Wagl., and *Psammoryctes noctivagus*, Poepp. (type-locality of both, Quinteio, Rio de Aconcagua), and *Poephagomys ater*, F. Cuv. (Coquimbo), all fully agree, as judged by such measurements and figures as are available. And the original *Mus cyanus*, Molina, should also be assigned to the same species, as has been done hitherto.

LXVII.—*Descriptions of new Species of Cetoniidæ from Madagascar, and some Notes on Synonymy etc.* By OLIVER E. JANSON, F.E.S.

THE species now made known are chiefly from Bejofo, a locality in the mountainous district north-west of Mandritsara, in the northern part of the island, and not previously visited by insect-collectors. The length-measurements given are taken from the front margin of the pronotum to the apex of the elytra, to accord with those given in Pouillaude's recent monograph 'Les Cétonides Malgaches.'

Coptomia diversa, sp. n.

Olive-green or deep violaceous-blue, shining; pygidium, underside, and legs darker or entirely black. Head sparsely punctured, more coarsely so between the eyes and smooth at the base; clypeus strongly furrowed at the sides and very deeply notched at the apex. Pronotum with scattered punctures at the sides and smooth on the disc. Scutellum large, smooth, the sides incurved on the basal half, obtuse at the apex. Elytra separately rounded at the apex, each with six striæ, more or less obsolete and indistinctly punctured in the male, but well-marked with closely-set arcuate punctures in the female, the sides with rows of strigiform punctures that are stronger in the female, apex strigose. Pygidium closely strigose and sparsely pubescent. Underside and legs with black pubescence, mesosternal process large, divergent, and obtuse or subnodose at the apex; metasternum closely punctured. In the male the abdomen is channelled and the fore tibiæ are slender and without teeth; in the female the club of the antennæ is shorter and the fore tibiæ have two lateral teeth.

Length 15–17 mm.

Mt. Tsaratanana, Madagascar (♂ ♀, coll. Janson).

This species is allied to *C. olivacea*, Waterh., but is larger and of a broader and more ovate form; the clypeus is longer and more deeply notched, the mesosternal process is stouter and more divergent, and there are no white spots on the exposed margins of the abdomen in either sex. The elytra in the female have a distinct fine alutaceous puncturation that renders the surface duller than in the male. I have submitted both sexes to Mons. A. Bourgoin for comparison with his type of *C. corrugata*, Bourg., and he informs me they are different and are a species unknown to him.

Pygora tristis, sp. n.

Resembles *P. ornata*, Jans., but rather more convex and of a duller black colour above; the elytra are without red markings and have the lateral white spot placed more forward, and in the male it is larger. The head is more closely and evenly punctured and has the side-margins of the clypeus less raised. The pronotum is more feebly angulated and margined at the sides, and is finely and remotely punctured over the entire disc. The striæ of the elytra are coarser, and in the male the whole of the third and the basal part of the first and second striæ consist of large arcuate punctures; there is, in addition, a short series of similar punctures between the first and second striæ, a humeral group, and a less defined row at the sides. The female is smaller and narrower than the male, has no white spots on the pronotum, and those on the elytra are smaller, the coarse puncturation is almost effaced on the elytra, and the pygidium has a smooth and very much stronger median carina than in *ornata*.

Length, ♂ 11–13, ♀ 9–10 mm.

Bejofo, N. Madagascar (♂ ♀, coll. Janson).

Pygora punctata, sp. n.

Shining green, head dusky, elytra more or less tinged with golden or fiery red at the sides; apex of the clypeus, pygidium, sides and apex of the body beneath, and the legs red-brown.

Similar to *P. punctatissima*, G. P., but with the head and pronotum more regularly punctured, the clypeus shorter and more broadly reflexed and rounded in front, the pronotum broader and more feebly margined at the apex, the elytra with the four discal striæ narrower, less curved, and with the geminate engraved lines closer together, the interstices broader and less convex, and the sides with fine scattered punctures but no regular rows or striæ. The white setose clothing on the pygidium, underside, and legs is also much coarser than in that species.

Length 6–7 mm.

Bejofo, N. Madagascar (coll. Janson).

The five specimens received are all of the female sex, and have the abdomen convex, the fore tibiæ with two lateral teeth, and the apical spurs of the hind tibiæ broadly obtuse.

Pygora decorata, sp. n.

This species is closely allied to the preceding (*P. punctata*) and is of a similar green colour, but differs in having the pronotum broadly suffused with red at the sides and with an indigo-blue median stripe which is broadest in the middle and does not quite reach the base, the elytra narrowly blue-black on each side of the scutellum, and the pygidium and hind femora bright green. The pronotum is slightly broader, more strongly margined at the sides, and less closely punctured; the elytra have a short stria on the inside of the humeral callus, three rows of punctures at the sides, the outer one of which continues round the apical callus and for a short distance on the second interstice; the median carina at the base of the pygidium is less prominent and the mesosternal process is broader.

Length 8 mm.

Ambositra, Madagascar (coll. Janson).

I have seen a single female example only.

Liostraca ansata, sp. n.

Most nearly allied to *L. jota*, G. P. Black or piceous, very shining; apex of elytra, pygidium, and tarsi red-brown, each elytron bearing a somewhat handle-shaped yellow figure composed of a triangular patch extending obliquely from the humeral callus to the sutural stria, and prolonged posteriorly on the outside by a marginal stripe that curves and turns inwards behind to the second stria at about one-fifth from the apex. Head rather closely punctured, sides of the clypeus feebly impressed and with the margin very slightly raised at the basal part only, the apex with a feeble central depression. Pronotum entirely rounded at the sides and basal angles, distinctly punctured at the sides and in front, but very finely and sparsely so behind. Scutellum incurved at the sides and acute at the apex. Elytra sculptured almost as in *L. jota*, but with the geminate engraved lines of the discal striæ interrupted and replaced by a simple punctate stria on the convex part in front of the transverse depression, and all the interstices less convex. Pygidium transversely strigose, mesosternal process obtusely triangular.

Length 7–8 mm.

Bejofo, N. Madagascar (♂ ♀, coll. Janson).

This pretty species, of which I have received five specimens, is in some respects intermediate between *L. jota*, G. P., and *L. semistriata*, Fairm.

Chromoptilia attenuata, sp. n.

Broad at the shoulders and more narrowed behind than any of the other species of the genus. Above dark dull brown or almost black, very densely and rugosely punctured, and with erect black or brownish hair as in *C. biobliqua*, Fairm. (*nickerli*, Moser), but in other respects more like *C. diversipes*, Westw., the pale yellow markings being somewhat similar and consisting of a spot of variable size on each side in front and a basal marginal band on the pronotum; the margins of the scutellum; on each elytron a transverse linear spot above the lateral sinus, two similar spots placed transversely a little before the middle (more forward than in *diversipes*), two between these and the apex, and one (sometimes absent) at the sutural angle; there is also a large spot on each side of the pygidium. Underside and legs shining piceous or blackish, with long grey pubescence and pale yellow markings; sides of the hind coxæ prolonged beyond the margin of the elytra; hind tarsi with the fringes either entirely red, or black with the apical part of the outside fringe and more or less of the inside one red; abdomen arched and slightly impressed in the male. The female has the pronotum shorter, broader, and more coarsely punctured.

Length 11–13 mm.

Bejofo, N. Madagascar (♂ ♀, coll. Janson).

The markings vary considerably; in some specimens the scutellum is entirely pale yellow and in others wholly dark.

The following notes refer to the monograph of the Cetoniidæ of Madagascar, "Les Cétonides Malgaches," by T. Pouillaude, published in 'Insecta,' vi.–x. (1916–20):—

Heterosoma concolor, Pouill. Insecta, v. 1915, p. 158. Although one of his own species, the author fails to include or in any way refer to this in his later-published monograph, but from the descriptions, which, however, do not precisely agree, it is probably the same as the *subnitidum*, Pouill., described as a new species in his monograph.

Coptomia ventralis, Jans., is erroneously quoted as a synonym of *Pyrrhopoda mantis*, Kr. I possess co-types of the latter and *P. cyanescens*, Kr., received from Kraatz, and they are identical with *C. marginata*, Waterh., as already recorded by Van de Poll, and quite distinct from *ventralis*.

Zebinus bimaculatus (Sikora), Kr., given as a synonym of *villosulus*, Jans., is a distinct species, of which I possess several specimens sent to me by Sikora.

Mausoleopsis eustalacta, Burm., of which the location of the type is given as doubtful, was in the Sommer collection, and is now in my possession.

LXVIII.—*New Species of Phytophaga from the Fiji Islands.*

By G. E. Bryant, Entomological Assistant, Imperial Bureau of Entomology.

The Phytophaga of Fiji are at present represented by only twenty described species, to which I now add thirteen. These have been forwarded by Mr. R. Veitch to the Imperial Bureau of Entomology for identification.

The Eumolpidæ will, I think, prove to be the family best represented in the fauna of Fiji when they come to be worked out, judging by the material forwarded, which includes many very obscure and probably variable species related to the genera *Hyperaxis*, *Demotina*, *Piomera*, etc.; but it is advisable to await more material before describing these.

The following is a list of the species now recognized:—

Cryptocephalidæ.

Ditropidus punctulum, Chap. C. R. Soc. Ent. Belg. xviii. 1875, p. lxxx.	N. S. Wales, Fiji Is.
—— *tibialis*, Chap. C. R. Soc. Ent. Belg. xviii. 1875, p. lxxix.	N. S. Wales, Fiji Is.
Cœnobius aureopilosus, sp. n.	Mt. Lautoka, Loloti.

Eumolpidæ.

Damelia marshalli, Clark, Journ. of Ent. ii. p. 256.	Viti.
Eurydemus insignis, Chap. Gen. Col. x. p. 334.	Viti.

Rhyparida luteola, Fairm. Le Naturaliste, i. 1879, p. 75.	Viti.
—— *punctatissima*, Fairm. „ „ „ „	Tonga.
—— *subæneicollis*, Fairm. „ „ „ „	Samoa.
—— *trapezicollis*, Fairm. „ „ „ „	Ovalau.
—— *dispar*, sp. n., „ „ „ „	Labasa.
Vitibia rufoviolacea, Fairm. Ann. Soc. Ent. Fr. 1881, p. 485.	Viti.
—— *formosa*, Baly, Trans. Ent. Soc. Lond. 1877, p. 40.	New Hebrides.
Labasa scutellaris, gen. et sp. n.	Labasa.

Chrysomelidæ.

Plagiodera violaceipennis, sp. n.	Natova, Ovalau.

Halticidæ.

Febra venusta, Clark, Journ. of Ent. ii. p. 262, pl. xii. fig. 5.	Fiji.
—— *semiaurantiaca*, Fairm. Ann. Soc. Ent. Fr. 1881, p. 490.	Ovalau.
—— *varioloidea*, Fairm. „ „ „	Ovalau.
—— *insularis*, sp. n.	Cuvu.
Phyllotreta blackburni, sp. n.	Cuvu, Nadar.
Aphthona veitchi, sp. n.	Lautoka.
—— *greenwoodi*, sp. n.	Loloti.
Crepidodera nigra, sp. n.	Labasa, Lautoka.
Psylliodes vitiensis, sp. n.	Cuvu, Lautoka Mts.

Galerucidæ.

Malacotheria funerea, Fairm. Ann. Soc. Ent. Fr. 1881, p. 487.	Viti.
—— *strigiscutata*, Fairm. „ „ „	Viti.
—— *lateritia*, Fairm. „ „ p. 488.	Viti.
—— *signatipennis*, Fairm. „ „ p. 489.	Ovalau.
Aulacophora quadrimaculata, F. Mant. Ins. i. p. 75. no. 111 = *austrocaledonica*, Montr. Ann. Soc. Ent. Fr. 1861, p. 299.	Oceania, Ovalau.
Khasia nigra, sp. n.	Nausori.
Monolepta vitiensis, sp. n.	Labasa.
—— *modesta*, sp. n.	Lautoka.

Hispidæ.

Promecotheca cœrulipennis, Fairm. Col. Polyn. p. 95.	Viti, Vavao.
—— *reichei*, Baly, Trans. Ent. Soc. Lond. 1869, p. 374.	Tonga and Viti.

Cryptocephalidæ.

Cœnobius aureopilosus, sp. n.

Oval, attenuate in front, æneous, and covered with short golden pubescence, underside rather darker, antennæ and legs fulvous. L. 2 mm.

Head short, depressed, epistoma smooth, eyes large and nearly touching at the summit, slightly emarginate at the insertion of the antennæ. Antennæ fulvous, extending a little beyond the base of the prothorax; first joint slightly thickened, the six apical joints compressed and triangularly dilated, forming a slender club. Prothorax æneous, clothed with rather dense golden pubescence, convex, and about twice as broad at the base as long, sides regularly rounded and converging to apex, basal margin truncate on either side of the medial lobe, which is strongly produced and triangular. Scutellum small, with the apex of the basal lobe of the prothorax resting on it. Elytra æneous, with golden pubescence, striate-punctate (the striæ more or less concealed by the pubescence), very little broader than the base of the prothorax, twice as long as the prothorax, slightly narrowed from the base to the apex, with the apex rounded. Legs fulvous. Ventral surface darker and less pubescent; the apical ventral segment in the ♂ about equal in length to the two preceding; in the ♀ the apical segment is very deeply notched.

Fiji Is.: Mt. Lautoka, 23. x. 1921; Loloti, 29. v. 1921 (*W. Greenwood*); four specimens.

This new species evidently forms a link between the genera *Bucharis* and *Cœnobius*. I prefer for the present to place it in the latter, on the character of the eyes practically meeting; but the strongly produced lobe to the basal margin of the prothorax places it very near to *Bucharis*.

Eumolpidæ.

Labasa, gen. nov.

Elongate, head with eyes a little narrower than the prothorax, eyes emarginate, a transverse depression between them, and a feeble longitudinal sulcus on the vertex; antennæ filiform, the first joint longer than the second and more swollen, the second and third joints about equal, and the following joints longer and about equal to each other, extending to about half the length of the elytra. Prothorax broader than long, with the sides rounded, anterior angles with a small tooth, the surface strongly and irregularly punctured. Scutellum strongly transverse, with the apical margin nearly straight, slightly produced in middle. Elytra wider at the base than the prothorax, elongate, punctate-striate, humeral callus prominent, epipleuræ broad and well defined for their whole length. Legs slender, intermediate and hind tibiæ strongly emarginate, claws appendiculate. Anterior margin of thoracic episternum concave, prosternum longer than broad.

This genus is allied to *Nodostella*, but can be separated on the unusual shape of the scutellum. It is more elongate than *Nodostella*, and the epipleuræ differ considerably, being much flatter in the latter.

Labasa scutellaris, sp. n.

Elongate, deep bronze, with rather vague testaceous markings on the elytra, basal joints of antennæ testaceous; legs testaceous, with the exception of the apical half of the femora, which is darker, and ventral segments fuscous. L. 4·5–5 mm.

Head reddish bronze, rather lighter in colour than the prothorax, rugosely punctured, with a transverse depression between the eyes and a feeble longitudinal sulcus not reaching the base. Antennæ with the four basal joints testaceous, the remainder fuscous, extending to about half the length of the elytra; the first joint longer and more swollen than the second, the second and third about equal, and the following joints longer and about equal to each other. Prothorax deep bronze, slightly broader than long, with the sides rounded, widest behind middle, the anterior angles with a small tooth, the surface strongly and irregularly punctured. Scutellum strongly transverse, deep bronze, glabrous. Elytra elongate, parallel-sided, from behind middle rounded to apex, strongly punctate-striate, deep bronze, with a testaceous line between the first and second rows of punctures from base to apex, the apex of the elytra narrowly testaceous, shoulders testaceous, a testaceous spot on each elytron, touching the second and fourth striæ, and situate about halfway between base and middle. Legs rather long and slender, testaceous, with the apical half of the femora fuscous, the intermediate and hind tibiæ emarginate at the apex. Underside bronze, with the ventral segments fuscous, about equal, with fine golden pubescence.

Fiji Is.: Labasa, vii. 1921, ix. 1922 (*R. Veitch*); two specimens.

Rhyparida dispar, sp. n.

Subovate, fulvous, disc of head and prothorax (except the margins) fuscous. L. 4·5–6·5 mm.

Head very finely punctured, with a transverse depression between the eyes, with a longitudinal fuscous patch extending from this depression to base, and in its centre a longitudinal sulcus. Antennæ filiform, extending beyond the middle of the elytra; the second joint about half as long as the first or third, the joints from the third to apex about equal, the first joint more swollen. Prothorax transverse, broadest a little before the base, sides slightly margined and converging to apex, more strongly punctured in its central area and finer at base; there is an irregular longitudinal patch extending from the centre of the prothorax to the base which is almost glabrous; the central area of the prothorax is also more fuscous. Scutellum about as broad as long, impunctate. Elytra very little broader at the base than the prothorax, widest just behind the shoulders, regularly punctate-striate. Underside fulvous, middle and hind tibiæ strongly emarginate at the apex. ♂.

The ♀ differs in its much larger size, its colour generally darker, with irregular fuscous patches on the elytra, and the antennæ are shorter.

Fiji Is.: Labasa, xii. 1921, ix. 1922 (*R. Veitch*); 3 ♂♂, 2 ♀♀.

Allied to the group containing the species *R. papuana*, Jac., and *R. impuncticollis*, Baly.

Chrysomelidæ.

Plagiodera violaceipennis, sp. n.

Oblong, convex; fulvous, with the apical joints of the antennæ darker, elytra metallic blue-purple; underside fulvous. L. 8 mm.

Head fulvous, longitudinally impressed between the eyes. Antennæ with the first four joints fulvous, the first joint longer than the second and about equal to the third, and the seven apical joints darker and more flattened and about equal to each other, and reaching not quite to the middle of the elytra. Prothorax fulvous, smooth and shining, transverse, more than twice as broad as long, with the sides converging from the base to the apex. Scutellum fulvous, smooth and shining, subtriangular. Elytra metallic blue-purple, convex, finely and irregularly punctured, a little broader than the base of the prothorax, oblong, with the sides broadest behind middle and slightly rounded to apex, and at the apical sutural angle produced into a minute tooth, the lateral border slightly flattened and reflexed, the humeral callus strongly marked, and the elytra at their base slightly depressed. Legs and underside fulvous, the central portion of the five ventral segments smooth and shining, with the sides unevenly punctured, the segments about equal to each other, the apical segment slightly notched.

FIJI IS.: Natova, 1916 (*R. Veitch*); one specimen. Ovalau (*H.M.S. 'Herald'*); one specimen, slightly immature.

Allied to *P. marginata*, Baly, from New Guinea, in structure, but differing in colour and in the lateral margin not being thickened but slightly flattened and reflexed. It resembles in colour *P. thoracica*, F., from W. Africa.

Halticidæ.

Aphthona veitchi, sp. n.

Subovate, flavous, shining; labium, apical joints of the antennæ and hind femora darker. L. 2 mm.

Head smooth and shining, with the front carinate between the antennæ, labium nearly black. Antennæ extending to about the middle of the elytra, with the four basal joints flavous, the apical joints much darker; the first joint about equal in length to the second and third combined, the fifth slightly longer than either the fourth or sixth. Prothorax smooth and shining, a little broader than long, with the sides slightly rounded and the anterior angles obliquely truncate. Scutellum triangular, flavous. Elytra ovate, a little broader than the base of the prothorax, slightly dilated behind middle, very feebly punctured. Underside flavous, with the posterior femora almost black with the basal third flavous, the hind tarsi with the first joint about equal to the second and third combined.

FIJI IS.: Cuvu, 5. vi. 1915 (*R. Veitch*); one specimen. Lautoka, 21. ii. 1919 (*R. Veitch*); four specimens.

This new species is somewhat allied to *Aphthona nigrilabris*, Duv., in general structure, but is a much smaller insect, differs in colour and in the scutellum not being black, and the punctuation of the elytra is not so well defined.

Aphthona greenwoodi, sp. n.

Ovate, convex, black, nitid, with the labrum, antennæ, anterior and middle legs and hind tibiæ fuscous. L. 2 mm.

Head finely punctured, labrum fuscous. Antennæ fuscous, with the base of the joints slightly paler, the first two joints about equal and more swollen than the following, reaching to about the middle of the elytra. Prothorax transverse, with the anterior angles oblique, strongly punctured, with the punctures wide apart, and a feeble longitudinal impression in the middle at the base. Scutellum triangular, smooth. Elytra a little broader than the base of the prothorax, strongly and irregularly punctured. Anterior and intermediate pair of legs fuscous, hind femora swollen and black, tibiæ and tarsi fuscous. Underside black, with the ventral segments feebly punctured; the first segment the longest, second, third, and fourth about equal, contracted in the middle, the fifth longer and fuscous, strongly notched. ♂.

FIJI IS.: Loloti, 19. xii. 1920 (*W. Greenwood*); 1 ♂.

Closely allied to *A. virina*, Jac., from Ceylon, but the prothorax is more transverse, the legs not entirely black, and the punctuation is coarser and more scattered.

Febra insularis, sp. n.

Oblong-ovate, fulvous, with the elytra metallic bronze-green with fulvous margin. L. 6 mm.

Head fulvous, vertical and strongly produced in front, the frontal portion glabrous, and behind the insertion of the antennæ to the base strongly punctured. Antennæ inserted close together, reaching almost to the apex of the elytra, the first joint long and clavate and about equal to the third, the second about a third as long as first, the first three joints almost glabrous, the remainder with short pubescence, the fourth to tenth about equal to each other, the apical joint longer and at the apex abruptly bent inward. Prothorax transverse, much broader than the base of the head, strongly and irregularly punctured, widest from middle to base, slightly rounded and converging to apex, anterior angles obtuse, sides with a narrow margin containing a row of six deep punctures, posterior margin strongly emarginate. Scutellum fulvous and glabrous. Elytra about four times as long as the prothorax, shining metallic bronze-green, narrowly margined all round with fulvous, finely punctate-striate, and rounded to apex. Underside and femora fulvous and glabrous, the tibiæ and tarsi fulvous with short pubescence, and with the basal portion of the tibiæ darker.

The ♀ differs in the antennæ being much shorter and extending only to about the middle of the elytra and in having the prothorax less densely punctured.

FIJI IS.: Cuvu, 26. viii. 1916, 19. viii. 1919 (*R. Veitch*); 5 ♂♂, 6 ♀♀.

Distinguished from the three species previously described by its larger size, more oval and stouter build, and its coloration.

Phyllotreta blackburni, sp. n.

Subovate, bronze-black, with the five basal joints of the antennæ and the base of the tibiæ testaceous, the elytra with a yellow discoidal vitta, bent in at the base and dilated at the apex; above closely and finely punctured. L. 2 mm.

Extremely like the Australian *P. australis*, Blackb., and the European *P. undulata*, Kuts.; distinct from *P. undulata* on account of the puncturation etc., but very close to *P. australis*, Blackb., of which it may only be a subspecies, but the four Fijian specimens before me are all very much smaller and have the five basal joints of the antennæ testaceous and are bronze-black, the elytral vitta is also slightly broader, with its inner margin straighter and slightly more bent inwards at the base.

FIJI Is.: Nadar, 10. viii. 1915 (*R. Veitch*); Cuvu, 10. vii. 1915 (*R. Veitch*); four specimens.

Crepidodera nigra, sp. n.

Elongate-ovate, nitid, entirely black with the exception of the basal joints of the antennæ, which are testaceous, and the apical joints, tibiæ, and tarsi, which are fuscous. L. 2·25 mm.

Head black, nitid, sulcate between eyes, vertex smooth; head with eyes not so broad as the prothorax. Antennæ extending a little beyond the middle of the elytra, the six basal joints testaceous, the first two rather swollen, the third to sixth more slender, and the five apical joints thicker and fuscous. Prothorax black, smooth and nitid, slightly transverse, with the sides slightly converging from the base, the anterior angles oblique, and at the base a strong transverse sulcus, terminated at each end by a short longitudinal sulcus. Elytra about twice as long as the prothorax, broader at the base than the prothorax, black and nitid, the basal half strongly but irregularly punctured, forming irregular striæ, which behind the middle become feeble and at the apex almost smooth. Underside black, with the tibiæ and tarsi fuscous.

Allied to *C. crassior*, Blackb., from N. Queensland.

FIJI Is.: Labasa, ix. 1922 (*R. Veitch*); two specimens. Mt. Evans, Lautoka, 4. iv. 1920 (*W. Greenwood*); one specimen.

Psylliodes vitiensis, sp. n.

Elongate-ovate, nitid, above æneous, antennæ piceous, with the basal joints testaceous, underside piceous, legs testaceous. L. 3 mm.

Head very finely punctured. Antennæ with the three or four basal joints testaceous, the apical joints piceous, gradually increasing in length to the apex. Prothorax transverse, broadest at the base, anterior angles obtuse, evenly punctured, the punctures stronger than on the head. Elytra broader than base of prothorax, with the sides parallel to behind middle and then rather slightly converging to the apex, feebly striate, but strongly punctate, the punctures becoming feebler towards the apex. Legs testaceous, the hind femora with æneous reflections; the apical process of the hind tibiæ long, but not so long as the first joint of the hind tarsi, apex bidentate. Underside piceous, with the ventral segments about equal to each other and finely punctured.

This new species is allied to *P. lubricata*, Blackb., and *P. breweri*, Baly, but more nearly to the former on account of the colour of the legs. It differs from *P. lubricata* in the prothorax being more finely punctured and the punctures on the elytra larger and not so close together; the prothorax has no coppery reflection, also the apex of the elytra is more pointed and not so bluntly rounded.

FIJI Is.: Cuvu, 28. viii. 1916 (*R. Veitch*); Lautoka Mts., 4. iv. 1920 (*W. Greenwood*).

Galerucidæ.

Khasia nigra, sp. n.

Black, shining, slightly metallic with the exception of the basal portion of the antennæ, the femora, coxæ, metasternum, and apical ventral segment, which are fulvous; elongate, widened posteriorly. L. 3·5 mm.

Head broad, black, rugose, eyes prominent, with a transverse impression behind the insertion of the antennæ. Antennæ black with the exception of the basal portion of the first joint which is fulvous, reaching to the apex of the elytra; first joint long and broadening to apex, and stouter than the remainder, second joint short, the third longer, the second and third together about equal to the first, the fourth and following joints more elongate. Prothorax black, shining, about as broad as long, very rugose, the sides constricted towards the base, the anterior angles with a short tubercle, the sides deeply impressed behind the middle. Scutellum large, transverse, black, shining, impunctate. Elytra widened towards the apex, black, shining, slightly rugose, the basal half more so than the apical, but much smoother than the prothorax, longitudinally deeply impressed from the shoulder for half the length of the elytra, the sides costate from the shoulder to just before the apex, the apex of each elytron rounded. Legs very long, black, with the basal half of the femora fulvous. Underside black, with the coxæ, metasternum, and apical segments fulvous, the first four ventral segments black and feebly punctured.

The ♀ differs in the abdomen being more dilated.

FIJI IS.: Nausori, v. 1921 (*R. Veitch*); ♂ and ♀ *in coitu*.

This new species is more closely allied to *Khasia andrewesi*, Jac., than to *K. kraatzi*, Jac.

Monolepta vitiensis, sp. n.

Elongate, blackish brown, nitid, with the antennæ, front of head, legs, shoulders, and underside testaceous. L. 2·5 mm.

Head black, smooth, with the exception ot the labrum and front, which are testaceous; a transverse impression behind the insertion of the antennæ extending between the eyes. Antennæ filiform, extending beyond the middle of the elytra, testaceous; the first joint long and slightly curved, longer than the second and third combined, the second and third about equal, the second slightly more swollen than the third, the fourth about equal to the second and third combined, and the remainder about equal to each other. Prothorax black, nitid, strongly punctured, much narrower than the elytra, very little broader than long, sides nearly straight, very slightly contracted to the base. Scutellum triangular, impunctate. Elytra brownish black, with a well-marked testaceous patch on each shoulder not reaching the scutellum, closely punctured, but not so strongly as on the prothorax, slightly depressed behind shoulders, broadest behind middle, and rounded at apex. Legs testaceous, with the femora darker, hind tarsi with the first joint longer than the rest. Underside testaceous or fuscous; the segments about equal and slightly pubescent.

FIJI IS.: Labasa, vii. 1921, 16. viii. 1922 (*R. Veitch* and *W. Greenwood*); five specimens.

Allied to *M. luctuosa*, Weise, from S. Australia.

Monolepta modesta, sp. n.

Elongate, entirely black nitid, prothorax with greenish reflections, the antennæ, tibiæ, and tarsi flavous. L. 2·5 mm.

Head black, smooth, labrum and front of head black, a transverse impression behind the insertion of the antennæ. Antennæ filiform, extending beyond the middle of the elytra, flavous, with the six apical joints fuscous; the first joint a little longer than the second and third together, the second and third about equal to each other, the fourth about equal in length to the first, fifth joint a very little shorter than the fourth, the fifth and remaining joints to apex about equal to each other. Prothorax black, nitid, with a slight greenish reflection, rather strongly punctured, narrower than the base of the elytra, slightly broader than long and very little contracted at the base, from middle slightly converging to apex. Scutellum black, impunctate. Elytra black, nitid, strongly and rather closely punctured, punctures about as strong as those on the prothorax, the sides gradually widening from base to beyond middle and there rounded to apex. Legs with the femora black and the tibiæ and tarsi flavous, the apex of the tibiæ slightly fuscous. Underside blackish, with the meso- and metasternum testaceous in the middle, and a lighter patch in the centre of the basal half of the first ventral segment; the ventral segments feebly punctured and slightly pubescent.

♂. The only external structural difference appears to be in the second and third joints of the antennæ being slightly longer.

Fiji Is.: Lautoka, 21. x. 1921 (*R. Veitch*).

Closely allied to *M. vitiensis*, Bryant, but differs in the labium and front of head being black, no testaceous spot at shoulders, colour of legs, and the punctuation is slightly stronger.

MISCELLANEOUS.

The Dates of Publication of Cuvier and Valenciennes' 'Histoire Naturelle des Poissons.' Octavo. Paris and Strassbourg. Vols. I.–XXII. 1828–1849. By C. Davies Sherborn.

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I. II.	Oct. 1828.
III.	Apr. 1829.
IV.	Nov. 1829.
V.	July 1830.
VI.	Sept. 1830.
VII.	Apr. 1831.
VIII.	Jan. 1832.
IX.	Mar. 1833.
X.	Sept. 1835.
XI.	July 1836.
XII.	Mar. 1837.
XIII.	Apr. 1839.
XIV.	Jan 1840.
XV.	Nov. 1840.
XVI.	Aug. 1842.
XVII.	July 1844.
XVIII.	Aug. (or Sept.) 1846.
XIX.	May 1847.
XX.	Nov. 1847.
XXI.	Sept. 1848.
XXII.	Jan. 1850 (*i. e.*, end of 1849).

There was a quarto issue; but the octavo issue should always be quoted.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 90. JUNE 1925.

LXIX.—*Additions to the Upper Liassic Fish-fauna of Holzmaden.* By ERROL IVOR WHITE, of the British Museum (Natural History).

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[Plates XXX.-XXXII.]

AMONG the specimens from Holzmaden acquired by the Museum within recent years are three well-preserved Holostean fishes belonging to the genera *Caturus* and *Sauropsis*. They present a number of novel features, which justify the creation of two new species.

The genus *Caturus* has not hitherto been recorded from the locality, and the new acquisition is of further interest as it has proved to be conspecific with the only other specimen of the genus noted from this horizon (A. S. Woodward, 1895, Cat. Foss. Fishes B.M. pt. iii. p. 348, no. P. 530).

Caturus smithwoodwardi, sp. n.

Diagnosis. A *Caturus* of elongate shape attaining a length of approximately 1 metre. Length of head with opercular apparatus greatly exceeding maximum depth of trunk and slightly less than one-quarter total length of fish. [Caudal region tapering to pedicle one-third maximum depth of trunk.] Teeth well developed, but small, and acutely pointed.

Dorsal fin tall, its height much greater than its length, and equal to three-quarters depth of trunk at its origin, with more than twenty-three rays. Origin of dorsal fin only slightly in advance of middle of back. Anal fin much smaller than dorsal and less elevated, of fifteen rays; origin just posterior to end of dorsal fin. [Scales smooth.]

Holotype. Brit. Mus. (N. H.) registered P. 11127.

Paratype. Brit. Mus. (N. H.) registered P. 530.

Horizon. Upper Lias.

Localities. Holzmaden and Boll, Würtemberg.

Description. The holotype (Pl. XXX.) is an imperfect fish lying on its right side. It is accidentally broken across immediately behind the pectoral arch, and has the fins, except the pectorals and anal, displaced upwards and forwards. The shape is elongate-fusiform, with an approximate length of 95 cm. and a maximum depth of 18·5 cm. The snout is pointed and the head (with opercular apparatus) long (23 cm.), and is further lengthened by about 2 cm. by crushing. The dorsal fin is tall and the caudal powerful.

The left side of the jaw-bones is preserved. The maxilla is slightly bent upwards in front and the hinder end turned down—an effect somewhat increased by distortion. It is 8·5 cm. long, with an expansion at the hinder end. Above the expanded portion lies an ill-defined supramaxilla; in front the imperfect premaxilla is seen bearing six large teeth. The mandible is stout and, as now preserved, measures 13 cm., but the angular, which is concave behind, has been somewhat displaced forwards. The bone is noticeably slender in front, measuring 0·4 cm. deep, and it increases regularly until the coronoid region is reached, and there it suddenly expands to a depth of 2·6 cm.

The teeth are acutely conical and relatively very small. All but three are missing on the maxilla, and these are not more than 0·5 cm. high. The premaxillary teeth are larger and at least 0·6 cm. in height, but of those few still preserved on the dentary the middle teeth measure but 0·5 cm., and they decrease in size towards both extremities, the empty sockets indicating, however, that they were rather irregular both in size and spacing. As the splenials are both a little displaced upwardly, their series of even smaller teeth are well displayed.

The arcuate preoperculum is conspicuous, lying in front of the faintly preserved operculum and suboperculum. These two bones have been crushed on to the anterior vertebral elements, which have pierced them. They must have been very thin; nevertheless, their outlines are visible, showing that they were shaped exactly as in *C. furcatus* *, with an approximate breadth of 5·4 cm., their depths being roughly 6·5 and 3·2 cm. respectively. Only eight branchiostegal rays can be distinguished, and of these the two hindermost alone are fully exposed. They are very broad. All these rays, as well as the remainder of the head, have been displaced forwards about 2 cm. In front lies part of the gular plate, but its limits are certainly not those in the photograph (Pl. XXX.), as the well-defined outline seen there is entirely due to preparation, and its hinder region includes part of the anterior branchiostegal rays.

The vertebral column is undisturbed except for the caudal dislocation; the pleurocentra and hypocentra are robust. The neural and hæmal elements call for little comment, except that the hæmal spines are much expanded to support the lower caudal lobe.

The dorsal fin is preserved, but its dermal rays are displaced. Its position and extent are sufficiently determined by the radials, of which twenty are visible. The fin arises slightly in front of the middle of the back, 30 cm. from the occiput, but it is more posteriorly placed than is usually the case. The dermal rays are remarkably stout, especially in their undivided proximal portion, which is 4·6 cm. long and 0·25 cm. broad; at least twenty-three rays may be counted. The articulated and dichotomized distal part of the ray increases the height of the fin to just under 14 cm. Fulcra are faintly indicated along the front border.

Only a few dermal rays of the anal fin remain, and these, though stout, are slighter and shorter than those of the dorsal. A number of endoskeletal radials in place mark the position of the fin as being similar to that in the genotype, *C. furcatus*.

The caudal fin is powerfully built and deeply forked, measuring over 31 cm. between the tips of the lobes, of which the upper one is very slightly displaced downwards. The rays are stout and the anterior border of each lobe bears a row of prominent fulcra, especially robust in the case of the upper lobe.

The pectoral girdle is only faintly indicated.

Both the pectoral fins are preserved in part, the distal portions being absent, and are restored in plaster. The anterior rays are also missing. Only five rays of the left fin remain. They are strong and dichotomize distally, but no signs of articulation or of fulcra are preserved.

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* See restoration, A. S. Woodward, *op. cit.* p. 331.

The ventral fins are represented only by a number of crushed and displaced rays.

The squamation is composed of very small scales, apparently smooth. The largest flank-scale does not exceed 0·5 cm. in height. Of their overlap nothing is indicated.

The second specimen (P. 530) is from Boll. Its proportions are almost identical with those of the holotype.

This fish lies on its left side, and the skeleton is unbroken except for a fissure across the opercular region. Although the dorsal fin is fragmentary and the ventral represented by the displaced endoskeletal supports, the specimen was, when found upwards of sixty years ago, probably finer than the newer and more attractively prepared example from Holzmaden, but the initial preparation was primitive and time has tended to obscure further the finer points.

As it lies the fish measures 95 cm., but it must have been a little larger than this, for the extreme tips of the caudal lobes are wanting.

The bones of the head-region are crushed and for the most part unrecognizable. However, one can make out the maxilla, which is displaced forwards and inverted. This bone is uncrushed, and it shows, as does the holotype, the upturned anterior extremity and the downwardly curved hinder oral margin. It is of exactly the same size as the Holzmaden maxilla—8·5 cm. The mandible is crushed behind. It is at least 15 cm. long, and bears a number of tooth-sockets, and immediately in front of the coronoid elevation three acutely conical teeth 0·5 cm. high. Below lie the partly exposed gular plate and one or two branchiostegal rays.

Apart from the deficiencies of the individual bones the specimen shows well several important points, especially the general form.

The vertebral column is more disturbed than in the first specimen, but some of the stout hypo- and pleurocentra are well exhibited, lying below the body.

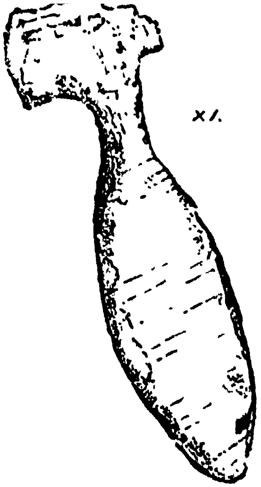
The dorsal fin is very fragmentary, the dermal rays and fulcra being scattered, and only eighteen of the anterior radials are preserved. The origin of the fin is 28 cm. from the occiput and 32 cm. from the base of the upper caudal lobe.

The anal fin, on the other hand, is perfect, but for the distal articulated portion of the dermal rays. Ten baseosts are preserved, but all, numbering fifteen, of the undivided portions of the dermal rays are present, the anterior member of which is bordered with numerous fulcra.

Nothing new is seen in the tail, but it shows that the depth of the caudal pedicle was only about 6 cm.

The paired fins are represented by scattered rays in the case of the pectoral and by the basipterygia of the ventrals. These last are inverted and displaced, and are shaped like canoe-paddles dorsally, with a distal expansion (text-fig. 1), and thus differ considerably from those of *C. heterurus* figured by Woodward (*loc. cit.* pl. ix. fig. 3). The better preserved of the two is 6·5 cm. long, with a maximum breadth of 1·5 cm.

Text-fig. 1.



Caturus smithwoodwardi, sp. n.
Inverted basipterygium of ventral fin. [P. 530.]

Remarks. This distinctive form has, among the other species of *Caturus* (sensu stricto, apart from the stouter-toothed subgenera *Strobilodus* etc.), but one rival in size—the genotype. It differs from all in its proportions, the number of fin-rays, and in the position of the fins, and is unlikely to be confused with any one of them.

I have with much pleasure named it after Sir Arthur Smith Woodward, F.R.S., who first identified these specimens generically, and to whom I am indebted for innumerable kindnesses[*].

Sauropsis veruinalis[†], sp. n.

Diagnosis. A *Sauropsis* of narrow elongate form, attaining a length of 60 cm. Head with opercular apparatus contained four times in the length to base of caudal fin, and greatly exceeding maximum depth of body. Length of body without head or tail five times depth at origin of dorsal fin. External head-bones finely pustulate; cleithrum delicately striated vertically. Teeth acutely conical, with fine longitudinal striæ; those on maxilla somewhat smaller than those on dentary, of which the anterior are much the largest. Dentary teeth well [and irregularly] spaced. A row of minute denticles on both upper and lower jaws external to principal dentition. Ventral fins rather nearer to pectorals than to anal; origin of anal a little anterior to that of dorsal. Scales finely pustulate, with a few anterior rugæ parallel to anterior margin; posterior border very finely crenulated.

Holotype. Brit. Mus. (N. H.) registered P. 13007.

Paratype. Brit. Mus. (N. H.) registered P. 13006.

Horizon. Upper Lias.

Locality. Holzmaden, Würtemberg.

Description. This species is represented by two excellently preserved specimens prepared by B. Hauff, and acquired as specimens of *Euthynotus* (?).

The first specimen, P. 13007 (Pl. XXXI.), is complete except for the ventral fin and the dermal rays of the anal fin. It lies on its right side, with the head bent upwards and the mouth wide open, while the pectoral fins are pressed flat, the right being extended below the body, the left upwards on the flank. The dorsal fin is a little disturbed, for it is rather lower and more forward in position than it should be.

The length of this specimen is 63 cm. and the maximum depth of the body approximately 10 cm.; the latter is therefore much exceeded by the combined length of the head and opercular apparatus, which is at least 13·5 cm., almost exactly one-quarter the total length of the fish excluding the tail (55 cm.). The depth of the body in this very elongate species decreases quite gradually towards the tail, and is

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[*] I have had to use a longer form of the specific name than is, perhaps, desirable, owing to the uncertainty of the generic position of *Sauropsis* (?) *woodwardi*, W. K. Gregory (Bull. Amer. Mus. N. H. vol. xlviii. art. viii. (1923) p. 230).

[†] Lat. *veruina* = a javelin.

8·7 cm. at the origin of the dorsal fin. This measurement and the length of the trunk measured from the anterior margin of the cleithrum to the origin of the caudal fin (42 cm.) are the only indisputable proportions common to both specimens of this species and to those of *S. latus* in the British Museum, and are therefore important for comparison of the two forms.

The bones of the head and face are too crushed for individual recognition, but the jaw-bones are more satisfactory, except the maxilla, which lacks teeth and is badly distorted. The dentary is long and slender, gradually deepening towards the hinder end. It is approximately 8·8 cm. long and nearly 2 cm. deep at the posterior extremity. The coronoid region is obscured. The bone bears an incomplete series of sixteen well-spaced teeth, which are slender in front, but increase somewhat in stoutness towards the middle of the bone. They all appear to be of much the same height—0·3 cm.,—but they have been rubbed and show but scant traces of the vertical striæ; and for this reason also the delicate external row of denticles is not demonstrably present.

The opercular bones are also crushed. The operculum is taller than broad, the maximum measurements being 4·5 cm. and 3·7 cm. respectively. The shape is apparently normal, with a slightly concave front margin roughly at right angles to the inferior, which is straight. The hinder and superior margins are confluent and have a broadly convex outline, forming a peak at the upper front corner of the bone. The suboperculum has straight upper and lower borders, and is convex behind and concave in front, where it is overlapped by the semilunar preoperculum. All the head and opercular bones have a finely pustulate ornament, that is very often removed, leaving a roughened surface exposed.

The pectoral girdle is only partly preserved, but the cleithrum shows fine longitudinal striæ.

The pectoral fins are fragmentary. The rays are strong and numerous, finely dichotomized, and only articulated at their distal extremities.

The ventral fins are not preserved in this specimen.

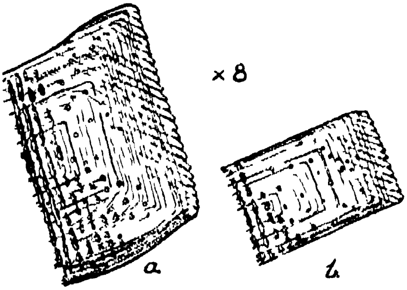
Ossified hypocentra and pleurocentra are wanting, but the neural and hæmal elements are, as usual, very numerous—an effect further increased by the dislocation of the left and right halves of the neural spines.

The dorsal fin is imperfect distally and posteriorly. The dermal rays are finely divided and, except that the proximal segment is much the longest, articulated throughout their length. A numerous series of slender radials is somewhat obscured by the downward displacement of the dermal portion.

Of the anal fin nothing but the baseosts remain, giving evidence of the greatly extended fin. Its position in relation to the dorsal is not perfectly clear in this specimen, as the latter fin is not quite in place. The upper lobe of the deeply cleft caudal fin measures 10 cm. from its base, where it is broken across and a trifle displaced; the lower lobe is imperfect towards the tip, and only 9 cm. now remains. The rays are dichotomized as in the other fins, and the proximal segment is likewise much the largest, measuring 4 cm. in length in the upper lobe and 5 cm. in the lower.

Fulcra are absent on all fins.

Text-fig. 2.



Flank-scales of *Sauropsis veruinalis*, sp. n. [B.M. no. P. 13007.]
a, main; *b*, dorsal. × 8.

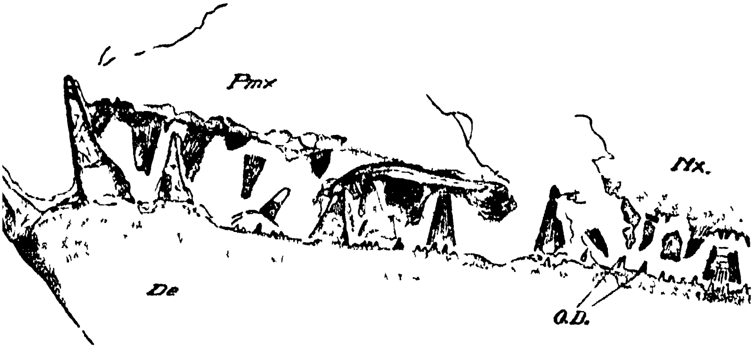
Numerous rhomboid scales are well preserved. They are extremely small, and the largest on the flank do not exceed 0·4 cm. in height and 0·3 cm. in breadth. Ventrally they become much shallower, and are three times as broad as high. The surface in well-preserved examples is finely pustulate and shows lines of growth parallel to the borders, especially to the ventral (text-fig. 2). Running near and parallel to the anterior margin are two or three ridges formed by the partial coalescence of the fine tubercles, which in the hinder upper portion of the scales also group themselves into oblique diagonal lines running downwards to the rear border, which is finely crenulated and perhaps also pectinated. These scale-features are so delicate that in ninety-nine scales out of one hundred they are wholly obliterated except for the anterior vertical ridges.

The second specimen—P. 13006 (Pl. XXXII.)—adds to our knowledge of the species on several points. It lies in a similar position to the holotype, but the lower jaws are shown from the gular aspect, and the opercular region is shattered and thereby drawn out.

This specimen is smaller than P. 13007, the length from the pectoral girdle to the origin of the tail being 37 cm. as compared with 42 cm. in the other. The maximum depth of the body is 9·1 cm., and the depth at the origin of the dorsal, which is clearly behind that of the anal, is 7·4 cm.

The prominent sclerotic has an external diameter of 2·6 cm. and the bones are roughened; but it is not possible to decipher the individual components.

Text-fig. 3



Anterior half of dentition of *Sauropsis veruinalis*, sp. n.

Pmx.=premaxilla, *Mx.*=maxilla; *De.*=dentary; *O.D.*=outer denticles. [B.M. no. P 13006.] × 4.

The short rostrum, formed by the fused vomer and ethmoid, is seen from below, and it projects about 0·8 cm. over the lower jaw. No teeth or even sockets are discernible.

The maxilla is long, narrow, and straight, except where bent down at the hinder end. The length is 5·5 cm. and the depth, which is almost uniform, 0·5 cm. The supramaxilla is wanting. The premaxilla measures 1·4 cm. in length.

The mandibular rami are exposed from below, with the dentaries and splenials somewhat separated. The more perfect right ramus is 7·8 cm. long. The mandible, shallow in front, rapidly expands to a depth of 1·4 cm., and is 1·6 cm. at the hinder end.

The acutely conical teeth are present in the anterior half of the jaws, and all are finely vertically striated. The largest members exposed are the most anterior dentary teeth, which are 0·4 cm. high and slightly curved. The succeeding teeth on the dentary are about two-thirds as large, while in the posterior half of the jaw, although only the stumps are visible as the mouth is closed, there seems to have been no further variation in size. These teeth are well spaced, but somewhat irregularly. Those on the premaxilla are similar in size and shape, but the maxillary teeth are much smaller and slenderer than the rest. On both maxilla and dentary, outside the teeth described, is an irregular row of minute teeth, which are similarly striated but do not exceed 0·05 cm. in height.

The pectoral fins are complete. Thirty-five rays can be counted in either fin, of which the first ray is one-half as broad again as the others, and it is undichotomized except at the distal extremity ; with the succeeding rays dichotomy starts progressively from front to rear nearer and nearer the proximal end, and none is articulated until the tip is almost reached.

The pelvic fins, represented by the crushed basipterygia with a few attached dermal rays, arise somewhat nearer to the pectorals than to the anal fin.

The axial skeleton is complete, and the absence of hypocentra or pleurocentra is clearly demonstrated. The slender neural spines are long and curve first backwards and then upwards, except those posterior to the dorsal fin, which sweep almost straight backwards. One hundred may be counted from the clavicle to the origin of the tail.

The anterior eighteen dorsal fin baseosts are in position, showing the origin of the fin to be opposite the fourth or fifth anal baseost. The dermal rays are disturbed and lie partly over the baseosts.

Only the distal tips of the first two or three dermal rays of the anal fin are missing. The fin was almost certainly less elevated than the dorsal, and decreases rapidly in height, to sweep away backwards as a low fringe. At least thirty-four baseosts are present, of which twenty support the rays of the fringe. The dermal rays are dichotomized distally and seem to be articulated throughout.

The squamation is nearly complete, but the scales have been rubbed smooth.

Remarks. This species is very distinct from its stouter contemporary, *S. latus*, the proportions being wholly different and the ventrals further back. No complete specimens of

Sauropsis latus, Ag., are in the National Collection, but direct comparison may be made with one specimen of this species—no. 20650—by the proportions of the length of the body without the head (and opercular apparatus) and tail, to the depth at the origin of the dorsal fin, which in *S. veruinalis* are 5 : 1 and in *S. latus* (20650) 4 : 1.

No confusion is likely to arise with the younger Solenhofen species.

In conclusion, I should like to tender my thanks to Sir A Smith Woodward and Dr. F. A. Bather for kindly reading through the manuscript.

EXPLANATION OF THE PLATES.

Plate XXX.

Caturus smithwoodwardi, sp. n. Holotype, Brit. Mus. N. H., P. 11127. Upper Lias, Holzmaden.

Plate XXXI.

Sauropsis veruinalis, sp. n. Holotype, Brit. Mus. N. H., P. 13007. Upper Lias, Holzmaden.

Plate XXXII.

Sauropsis veruinalis, sp. n. Paratype, Brit. Mus. N. H., P. 13006. Upper Lias, Holzmaden.

LXX.—*A new Species of* Caligus *from Egypt*, Caligus pageti, *sp. n.*

By F. S. Russell, D.S.C., B.A., Assistant Naturalist at the Laboratory of the Marine Biological Association of the United Kingdom, Plymouth.

[Plates XXXIII. XXXV.]

Female (Pl. XXXIII. fig. 6).—Carapace slightly longer than rest of body: as wide posteriorly as it is long and narrowing anteriorly.

Frontal plates prominent with anterior margin only slightly curved, with a small central incision.

Lunules large, fairly widely separated, and not projecting. Posterior sinus wide and inclined to the central axis, leaving the median lobe just over half the entire width of the carapace and projecting a little beyond the lateral lobes posteriorly. Lateral lobes broad and well rounded.

Free segment just over twice as wide as it is long;

spindle-shaped. Genital segment slightly wider than long; width equal to half that of the carapace; fifth limbs represented by three small plumose spines on the postero-lateral corner of the segment which are visible dorsally (Pl. XXXIII. fig. 5). Abdomen one-jointed: nearly as wide as long, not quite half as long as the genital segment. Anal lamellæ with three long central plumose setæ and one short one on either side (Pl. XXXIII. fig. 10).

First antenna large and prominent: middle joint well armed with stiff plumose spines, thirteen in number and not quite twice the length of the terminal joint, which is club-shaped and bears a few hairs (Pl. XXXIII. fig. 3).

Second antenna stout; terminal joint bent sharply inwards to form a hook; small accessory spine about midway along terminal joint. The inner surface of the middle joint is finely ridged (Pl. XXXIII. fig. 7).

First maxilla small and fairly well curved, swollen at the base (Pl. XXXIII. fig. 2).

Second maxilla small, triangular, with rudimentary exopodite consisting of two small spines (Pl. XXXIII. fig. 8).

First maxillipedes long and slender, terminal joint bearing one small accessory spine halfway along its length with two claw-shaped spines at its extremity, the shorter of which is toothed along both edges (Pl. XXXIII. fig. 1).

Second maxillipedes with a stout and somewhat elongated basal joint with a slight projection on its inner margin, where the tip of the terminal joint will meet it when the jaw is closed; terminal joint with small accessory spine at base of terminal claw (Pl. XXXIV. fig. 15).

Mandibles with twelve teeth.

Sternal fork with blade-shaped blunt-ended branches, diverging at first, then curving in slightly at their tips; outer margins well curved and inner edges curving to a like degree, so that the width remains equal all along the branch (Pl. XXXIV. fig. 16).

First thoracic leg: basal joint with a blunt short spine distally and a short sharp spine proximally on its posterior margin; second joint fringed with small hairs on its posterior margin and a small spine at its anterior distal corner; terminal joint with four weak terminal claws of equal length and three long plumose setæ along its posterior margin (Pl. XXXIV. fig. 13).

Second thoracic leg: basipodite with one inturned plumose seta; exopodite three-jointed; basal joint with one plumose seta on its inner margin and one spine on its outer distal corner; second joint with one long plumose seta on its inner margin and a spine at its outer distal corner; terminal joint with six plumose setæ and two spines, the outer one of which is very small. Endopodite three-jointed; basal joint with one long plumose seta on its inner margin; second joint with two plumose setæ, and terminal joint with six arranged round its margin (Pl. XXXIV. fig. 18).

Third thoracic leg: basipodite with one inturned plumose seta; exopodite, basal joint with claw; middle joint with one spine on its outer margin and one plumose seta on its inner; terminal joint with four plumose setæ and three short spines; the middle and terminal joints are very nearly fused. Endopodite two-jointed: basal joint with one long plumose seta; terminal joint with six plumose setæ arranged along the inner half of its margin (Pl. XXXIV. fig. 11).

Fourth thoracic leg: two-jointed, long and slender; basal joint with sharp spine at outer distal corner, terminal joint with one spine midway along its margin, where the second joint has fused with it, and one at its outer distal corner, bearing at its tip one long slightly curved spine which is well toothed along its two edges; this spine is about 0.3 mm. long and is a noticeable characteristic of this species (Pl. XXXIV. figs. 12 & 14).

Fifth thoracic leg rudimentary, represented by three short plumose spines on the postero-lateral corner of the genital segment (Pl. XXXIII. fig. 5).

Total length 5·6 mm.; width of carapace 3; length of carapace 3; width of median lobe 1·6; width of free segment 0·75; length of free segment 0·3 mm.; width of genital segment 1·5; length of genital segment 1·4; width of abdomen 0·52; length of abdomen 0·61; egg-cases, width 0·36, length 4·5. One egg-case held 58 eggs.

Male (Pl. XXXIII. fig. 4).—Slightly smaller than the female. Carapace equal to half the total length; similar in shape to that of the female. Genital segment slightly more than half the size of that of the female.

The only limbs that differ from the female are the second antennæ and the second maxillæ.

Second antennæ slightly stouter than those of the female; the middle joint is ridged on its inner surface and is sharply bent near its tip where it bears three stout claw-like spines (Pl. XXXIII. fig. 9).

Second maxillipede has the basal joint very much stouter than that of the female, being nearly twice as broad; this joint bears on its inner margin a stout hollowed projection, into which the tip of the claw fits; it also has a small accessory spine midway between this projection and the articulation of the terminal joint.

The terminal joint carries a small accessory spine at the base of the claw with which it ends (Pl. XXXIV. fig. 17).

Total length 5 mm.; width of carapace 2·5; length of carapace 2·7; width of free segment 0·7; length of free segment 0·3; width of genital segment 0·9; length of genital segment 0·75; width of abdomen 0·55; length of abdomen 0·55.

Nauplius (Pl. XXXV. fig. 19).—Body oblong; sides nearly parallel except in the posterior third, where the body narrows; front end broad. Ratio of width to length, 2:5.

First antennæ uniramous, terminating in two long and one short setæ. I was unable to obtain any indication that these setæ were plumose.

Second antennæ and mandibles biramous; exopodites with four plumose setæ and endopodites with two.

Anal setæ slightly curved, projecting sideways from body. Pigment rusty and green, located in a band at the front end of the hinder half of the body.

Length 0·4 mm.; width 0·16.

Metanauplius (1st moult) narrow and elongated (Pl. XXXV. fig. 23).—First antenna two-jointed; basal joint with one seta at its distal end and two at its proximal end; terminal joint with a large number of plumose setæ irregularly arranged.

Second antenna typical, biramous; exopodite short, ending in a very short spine; endopodite terminates in a curved claw, with a small accessory spine at its base.

First maxilla small and horn-shaped.

Second maxilla: exopodite with two setæ; endopodite typical.

First maxillipede: terminal joint bears at its extremity a spatulate claw with straight stiff spines arranged in a brush-like manner on its palmar surface and curved spines arranged in a similar manner on its upper surface; at the base of this claw is another leaf-shaped protrusion with its palmar surface similarly covered with spines to form a brush; at the base of the claw is a row of fine hairs or spines round the end of the terminal joint to form a sheath; the structure of this limb could only be made out satisfactorily with the aid of an oil-immersion lens. This curious limb is obviously adapted for scraping, and further mention of its use is made on page 616 (Pl. XXXV. figs. 20 & 25).

Second maxillipede considerably longer than the first, terminating in a stout claw with an accessory spine at its base.

First thoracic leg: basipodite with one seta on external margin; endopodite with six long plumose setæ; exopodite with three plumose setæ on the inner half of the posterior margin and three short spines on the outer half.

Second thoracic leg similar to the first.

No sign of genital segment.

Anal lamella with five plumose setæ (Pl. XXXV. fig. 26).

Colour rusty-brown with a touch of pink.

Total length 0·69 mm.; width of carapace 0·25; length of carapace 0·4.

Metanauplius (2nd moult): slight changes are now apparent.—First antenna; one of the end-setæ on the terminal joint has become very much coarser than any of the others and is longer than any.

Second thoracic limb: the plumose setæ have become very much longer.

The third thoracic limb is appearing as a stump with two spines.

The genital segment has now appeared.

Chalimus Stages.—Several of these stages were obtained from the fins of mullet. Amongst these there are three sizes, showing at least three moults.

First stage (Pl. XXXV. fig. 22): the front end of the carapace is pointed, and there is no sign of the lunules.

First antenna shows little change from the metanauplius; the setæ on the terminal joint are, however, now much shorter.

Second antenna is now taking on the adult form, but the claw is very stumpy and unformed.

First maxillipede slender; terminal joint bears a claw-shaped spine slightly toothed at its tip, and also one short spine.

Second maxillipede shorter and stouter than first maxillipede and assuming adult form; as yet no accessory spine on terminal joint, and no projection on basal joint.

First thoracic leg: basipodite with spine at anterior distal corner, and one halfway along posterior edge; exopodite is two-jointed; the first joint bears a spine on its anterior distal corner; terminal joint with four spines and three setæ. Endopodite present; one-jointed, with two setæ at its extremity.

Second thoracic limb has practically assumed adult form.

Third thoracic leg is almost nearly adult, setæ still rather short and stumpy.

Fourth thoracic limb with two round rudimentary joints just appearing, bearing two short spines at its extremity.

Fifth thoracic represented only by two very small spines on the postero-lateral corner of the genital segment.

Length of carapace 1 mm.; width of carapace 0·74; total length 1·6.

Second stage (Pl. XXXV. fig. 24): the total length at this stage was 2·8 mm.

Length of carapace 1·5 mm.; width of carapace 1·2; length of genital segment 0·3; width of genital segment 0·5; length of abdomen 0·3; width of abdomen 0·3.

The carapace is still somewhat elongated, though not pointed in front; the lunules are now appearing.

The limbs have practically taken on their typical adult forms.

Third stage: total length 4·5 mm.

Length of carapace 2·3 mm.; width of carapace 2·3; length of genital segment 0·58; with of genital segment 0·85; length of abdomen 0·5; width of abdomen 0·5.

After this last moult the animal becomes free-swimming; immature females were captured free-swimming.

Remarks.—This parasite appeared in 1922 on grey mullet, *Mugil capito* (Arabic, *tobar*), kept under observation in experimental fish-ponds on the shores of Lake Maryût, at Mex, near Alexandria, Egypt. It was first discovered by Mr. G. W. Paget, then Director of Fisheries Research to the Egyptian Government. On my joining the same service in 1923 Mr. Paget very kindly gave me some adult specimens to describe, and I was, later, able myself to obtain the other stages of its life-history. Neither Mr. Paget nor I ever saw a parasite of this kind on mullet caught in the lake itself.

After its first appearance it spread rapidly to such an extent as to do considerable harm to the mullet under observation, many of which became emaciated and covered with sores.

This is interesting as showing what damage such a parasite, comparatively harmless in normal surroundings, may do when the fish which act as its host are kept in a confined space, thus increasing the chances of the metanauplius finding a place to settle.

Mention has been made on p. 614 of the peculiar structure of the first maxillipedes of the metanauplius. I was fortunate in observing the use to which these limbs may be put.

On January 28th, 1923, I placed a female adult, with eggs well advanced, in a tube. This specimen had been captured in a tow-net in one of the experimental ponds. The next morning the nauplii had hatched, and at 10.45 A.M. I placed them in a bell-jar in which the water was kept well agitated by a plunger. At 10 A.M. on February 1st, I noted that the nauplii had moulted to metanauplii. On February 7th I could see no change in them. On February 8th, at 1 P.M., I placed two or three young mullet about 2 or 3 cm. in length in the jar. These fish had been living in a similar jar. In two days' time, on February 10th, at 9.30 A.M., the mullet appeared to be in a very sorry condition, lying on the bottom of the jar. On examining these fish under the microscope, I discovered that they were covered with the metanauplii. These had dug their second antennæ and second maxillipedes deep into the fish, so that they stood away from the body of the fish as described by Wilson *.

The first maxillipedes now were seen to be working at a very rapid rate, scraping and tearing at the skin of the fish (Pl. XXXV. fig. 21). Every now and then this action would cease, and the thoracic legs would get into motion, and set up a current which threw the débris, consisting of fine strips of skin, out to the rear, much as the earth comes out between the back legs of a dog when it is digging.

By the next day one of the mullet had died, and the following day another was discovered dead. The metanauplii had by now worked their own destruction owing to the decomposing of their prey.

It seems possible that this may be the manner in which the metanauplius obtains its food before fixing itself to its host.

EXPLANATION OF THE PLATES.

Plate XXXIII.

Fig. 1. First maxillipede.
Fig. 2. First maxilla of female.
Fig. 3. First antenna.
Fig. 4. Adult male, 5 mm. in length; width of carapace 2·5 mm.
Fig. 5. Fifth thoracic leg, represented by three plumose spines on posterior corner of genital segment.
Fig. 6. Adult female, 5·6 mm. in length; length including egg-sacs 9·4 mm.
Fig. 7. Second antenna of female.
Fig. 8. Second maxilla of female.
Fig. 9. Second antenna of male.
Fig. 10. Anal lamellæ.

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* Wilson, C. B., "North American Parasitic Copepods belonging to the Family Caligidæ," Proc. U.S. Nation. Mus. vol. xxviii. p. 546.

PLATE XXXIV.

Fig. 11. Third thoracic leg.
Fig. 12. Fourth thoracic leg.
Fig. 13. First thoracic leg.
Fig. 14. Portion of terminal claw of fourth thoracic leg to show teeth.
Fig. 15. Second maxillipede of female.
Fig. 16. Sternal fork.
Fig. 17. Second maxillipede of male.
Fig. 18. Second thoracic leg.

PLATE XXXV.

Fig. 19. Newly hatched nauplius, 0·4 mm. long.
Fig. 20. First maxillipede of metanauplius seen from side.
Fig. 21. Metanauplius showing feeding-position.
Fig. 22. Early chalimus stage, 1·6 mm. long.
Fig. 23. First metanauplius stage, 0·69 mm. long.
Fig. 24. Chalimus stage, 2·8 mm. long.
Fig. 25. First maxillipede of metanauplius, terminal claws.
Fig. 26. Anal lamellæ of metanauplius.

LXXI.—*A List of* Acrididæ (*Orthoptera*) *collected in the Tukuyu* (*New Langenburg*) *District, Tanganyika Territory.* By N. C. E. MILLER, F.E.S.

THE following list is based on the results of fourteen months' collecting by the writer and by natives in a district which has by far the greatest rainfall in the Territory. The only months on which one can really rely for fine weather are August, September, and October.

From the end of October until about the end of the year heavy rains, accompanied by severe thunderstorms, fall almost daily. Towards the last week of the year and onward till July an almost uninterrupted steady rain falls, and during the "fine" intervals heavy mists roll up from the direction of Lake Nyasa, enveloping the countryside, giving it a most dismal appearance.

These unpleasant climatic conditions make field-work difficult and uninviting, to say nothing of being detrimental to health. Such conditions are also unfavourable to this order of insects.

The country surrounding Tukuyu is of the open grassy upland type, with small clumps of low bushes in the valleys, and scattered trees and banana-plantations on the hill-sides.

The altitude of the township is 5084 feet above sea-level—consequently the temperature, especially during the period of almost incessant rains, is low.

It was found useful to publish a complete list of the captures, since exact records of Acrididæ from East Central Africa are very scanty, and practically nothing is known of the fauna of its uplands.

The compilation of this list and the comparison of types were carried out in the British Museum, and the writer is greatly indebted to the authorities for the privilege of working there.

The writer would also like to express his most sincere thanks to Mr. Uvarov, F.E.S., of the Imperial Bureau of Entomology, for his most valuable assistance, and to Dr. W. T. Calman for his kindness in lending a drawing apparatus.

The types of the new species are in the British Museum (Natural History), where they may be studied.

1. *Paratettix scaber*, Thunbg.

Abundant. Is very frequently found on paths and bare open spaces. September, October.

2. *Acrida sulphuripennis*, Stål.

September to December.

3. *Acrida crocea*, Bol.

Moderately abundant. A fairly large series was collected, which show considerable variation in coloration from green to reddish brown. Some specimens are densely spotted with black. September to December.

4. *Cannula linearis*, Sauss.

Quite common. Coloration ranges from stramineous to reddish brown or black. December, January.

5. *Machæridia bilineata*, Stål.

Very abundant. September to December. Many individuals spotted with black.

6. *Phorenula vittata*, Uv.

Not apparently abundant. August.

7. *Faureia milanjica*, Karsch, var. nov.?

Mr. Uvarov compared specimens from Tukuyu with the type of *Raphotittha milanjica*, Karsch (which he refers to the genus *Faureia*, Uv.), and found them to differ in smaller size, shorter tegmina, and in paler coloration, the hind femora, even in the darkest specimens, being with but faint transverse fasciæ. In his opinion it would be premature to split up the species until more material from various localities is studied.

Moderately abundant. July to December.

	♂. mm.	♀. mm.
Total length	15·5	22
,, ,, pronotum	3·5	5
,, ,, tegmina	16	20
,, ,, post. femora	11·5	14

8. *Duronia chloronota*, Stål.

Massoko (3000 feet approx.), June; Tukuyu, March. A short series only.

9. *Orthochtha dasycnemis*, Gerst.

Very abundant. September to December.

10. *Pseudochirista temporalis*, Stål.

Very abundant in open grass-land. August to December.

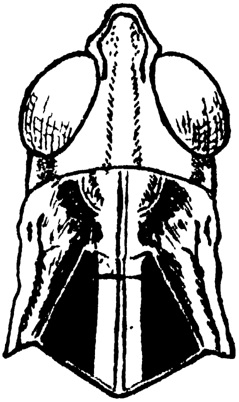
11. *Pseudochirista fallax*, Karny, *elongata*, subsp. n.
(Type ♂, fig. 1.)

Moderately abundant in the same habitat as that of *P. temporalis*. August to December.

This subspecies differs from *P. fallax* in the greater length of the tegmina and of the posterior femora, which are also more slender and distinctly reddish below.

	♂. mm.	♀. mm.
Total length	18	22
,, ,, pronotum	4	4·5
,, ,, tegmina	17·5	21
,, ,, post. femora	13	14

Fig 1.



Pseudochirista fallax, Karny, *elongata*, subsp. n.
Head and pronotum of male from above.

12. *Aiolopus thalassinus*, Fab.

Common. September, November, February.

13. *Pnorisa squalus*, Stål.

Moderately abundant. July, August, September.

14. *Paracinema tricolor*, Thunbg.

Very common. August to December.

15. *Heteropternis couloniana*, Sauss.

Very common during most months of the year.

16. *Heteropternis saussurei*, Kirby.

Four specimens taken at Massoko (3000 feet approx.), June 8, 1924, in rough herbage near the crater-lake.

17. *Morphacris fasciata*, Thunbg.

Very abundant. Only one individual with yellow wings seen on the road between Tukuyu and Lughombo. November 1924.

18. *Acrotylus patruelis*, H.-S.

Apparently not very abundant. Only two specimens captured. August.

19. *Gastrimargus africanus*, Sauss.

Abundant. September.

20. *Gastrimargus verticalis*, Sauss.

Abundant. September.

21. *Humbe tenuicornis*, Schaum.

Fairly common.

22. *Petasia fuscorosea*, Sjöst.

Two specimens, March; one, December.

23. *Taphronota poultoni*, Bol.

Very common. Mostly found in the dampest places, where herbage is most luxuriant. December to March.

24. *Ischnacrida monteiroi*, Bol.

Moderately abundant. October to January.

25. *Phymateus viridipes*, Stål.

One ♂, June, and one ♀, December.

26. *Chrotogonus rotundatus*, Kirby.

One ♀, February.

27. *Ornithacris cyanea pictula*, Walk.

Moderately abundant, but less so than the next-mentioned subspecies.

28. *Ornithacris cyanea magnifica*, Bol.

Abundant. September, October, January.

29. *Acanthacris lineata flava*, Sjöst.

Abundant. Frequently found in gardens. January.

30. *Cyrtacanthacris æruginosa*, Stoll.

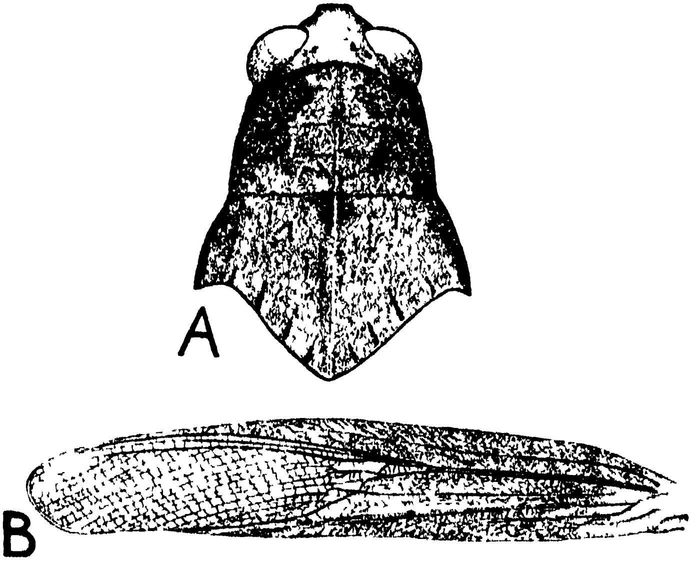
Abundant. August, January.

31. *Phyxacra uvarovi*, sp. n. (Fig. 2, A & B.)

Type ♀.

Antennæ moniliform, feebly compressed. Eyes moderately prominent, regularly oval. Distance between the eyes slightly less than greatest fastigial width. Fastigio-facial angle obtuse-angulate, with the angle well rounded. Frontal ridge in profile very feebly concave below ocellus; from the front widening slightly above and subparallel below ocellus; sulcate for part of its length below ocellus. Supplementary facial carinæ straight and diverging considerably. Fastigium, viewed dorsally, truncate, with the lateral margins arcuate. Surface of face and genæ strongly rugose, of occiput and fastigium smooth. Anterior margin of pronotal disc feebly

Fig. 2.



Phyxacra uvarovi, sp. n.

A. Head and pronotum of female from above.
B. Tegmen of male.

rounded; posterior margin acute-angulate; anterior and posterior margins of lateral lobes almost straight; inferior margins rounded. Median carina distinct and divided into four distinct parts by transverse sulci; in profile carina of prozona arcuate, of metazona feebly arcuate; surface very coarsely punctate and rugose. Prosternal spine rounded apically and feebly compressed laterally. Surface of pleura rugose, of sternites smooth. Abdomen carinate dorsally and moderately compressed laterally; underside of body covered with fairly dense soft hairs. Genitalia of both sexes as in *Phyxacra strenua*. Legs robust, hirsute. All carinæ of femora of posterior pair strongly serrate; genicular arches moderately rounded; genicular lobes rounded apically and curving inwards feebly; external faces nearly flat, with oblique ridges distinct, serrate. Tegmina coriaceous, rounded apically, with a slight oblique truncation; reticulation in the basal half rather loose, with the cells not elongate; in the apical half the veinlets are irregular.

Antennæ brownish ochraceous. Eyes dark amber. Fastigium and occiput whitish brown in freshly killed specimens; margins of fastigium dark brown, rest of head reddish brown with darker brown markings; mouth-parts dark amber, major portion of pronotal disc reddish ochraceous (in fresh specimens whitish brown), forming roughly a lozenge-shaped marking with the smallest angle in front, rest of pronotum dark reddish brown; median anterior area of metazona of disc with a brown marking, behind which are some brown spots; along the posterior margin of metazona are ten brown spots. Meso- and metanotum greenish white. Sternites light brownish orange. Abdomen light brownish orange. Anterior and median legs brownish, undersides of tarsi of all legs greenish; superior faces of femora of posterior legs brownish, with indistinct black fasciæ; inferior faces bluish grey: internal faces reddish; inferior external carinæ orange, maculate with black; tibiæ of posterior legs dark purplish; spines ivory-white, black apically. Tegmina brown, with indefinite blackish spots. Wings neutral orange, with the apices gradually becoming smoky.

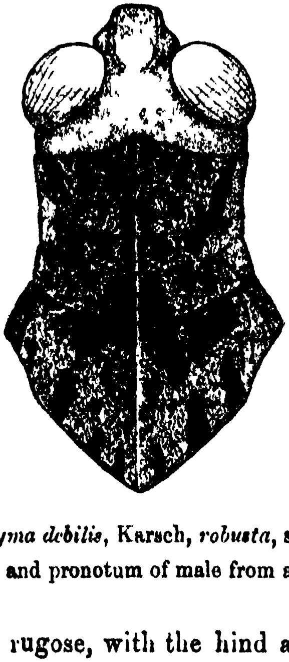
Differs from *P. strenua* as follows:—Larger and more robust. The ventral surface much more hairy. Surface of face strongly rugose. Frontal ridge distinctly sulcate. Fastigium of the vertex smooth. Distance between the eyes equal to two-thirds greatest fastigial width. Pronotum thicker and scarcely constricted in prozona. Lateral lobes strongly rugose. Median carina more strongly pronounced. Wings neutral orange, with the apices becoming smoky. Reticulation in the basal half of the tegmina rather loose, and in the apical half the veinlets are irregular, not oblique as in *P. strenua.* All carinæ of posterior femora strongly serrate; external faces nearly flat.

	♀ (type). mm.	♂ (paratype). mm.
Length of body	41	28
,, pronotum	12	7
,, tegmina	40	27
,, post. femora	22	15

32. *Bryophyma debilis*, Karsch, *robusta*, subsp. n.
(Fig. 3.)

Very common. Differs from *B. debilis sigillata*, Bol., by its larger size and by the pronotum being more compressed laterally and more rugose, with the hind angle subacute, not rounded.

Fig. 3.



Bryophyma debilis, Karsch, *robusta*, subsp. n.
Head and pronotum of male from above.

The general coloration is greyish in living specimens and brownish orange in dried specimens, not pale olive-green as in *B. debilis sigillata.*

Found from October to January, mostly in low scrub.

	♂. mm.	♀. mm.
Total length	44	68
,, ,, pronotum	10·5	14·5
,, ,, tegmina	44	54
,, ,, post femora	23	29·5

33. *Rhytidacris punctata*, Kirby.

One specimen only. September.

34 *Nomadacris septemfasciata*, Serv.

One specimen (♂), November; one (♀), January.

35. *Oxyrrhepes procera*, Burm.

One ♂ and one ♀, October; one ♀, September.

36. *Spathosternum pygmæum*, Karsch.

Very abundant in short grass. August, September.

37. *Oxya viridivitta*, Walk., var. *minor*, Sjöst.

Very abundant. August, September.

38. *Mesopsera filum*, Bol.

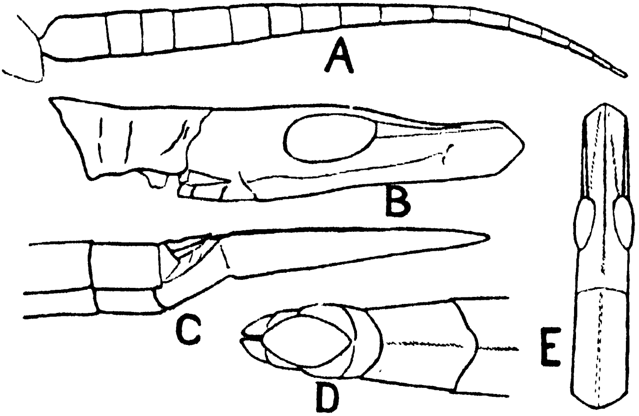
Not very common. December.

39. *Mesopsis brevicauda*, sp. n.

(Fig. 4, A, B, C, D, & E.)

Antennæ considerably compressed dorso-ventrally and widened for the greater part of their length; equal to about one and a half times the length of the head and pronotum together. Eyes hardly prominent, elongate-ovate; distance between the eyes equal to about half the greatest fastigial width. Fastigio-facial angle narrowly rounded, acute-angulate. Fastigium viewed dorsally rotundato-angulate apically, with its lateral margins parallel and elevated, and with a distinct medio-longitudinal carina on the disc. Occiput feebly rounded. Exposed portion of the head dorsally equal to about one and a half times the length of the disc of the pronotum. Frontal ridge in profile almost straight, feebly sulcate throughout, depressed round and slightly constricted below median ocellus. It becomes narrower towards the fastigium and broader on its junction with the clypeal suture. Supplementary facial carinæ distinct and feebly sinuate. Surface of the head smooth except the occiput, which is feebly rugulose. The anterior and posterior margins of the pronotal disc and the surface of the disc rounded; median carina feeble; anterior and posterior margins of lateral lobes feebly concave, inferior margins strongly bisinuate and thickened; surface finely punctulate and rugulose. The prosternal spine is short, rounded apically, and considerably retrorse. Abdomen slender, slightly carinate dorsally; the supra-anal plate of the male is narrowly rounded apically, with the lateral apical margins slightly constricted, and with a median basal depression; subgenital plate of the male rostrate, slender, half as long again as pronotum, laterally compressed, and acute apically; the supra-anal plate of the female is compressed basally laterally, with the apex narrowly rounded and compressed dorso-ventrally, the basal margin of the compressed part being angular; surface punctate; subgenital plate of the female broadly rounded apically and with

Fig. 4.



Mesopsis brevicauda, sp. n.

A. Antenna of male.
B. Head of male from side.
C. Apex of abdomen of male from side.
D. Apex of abdomen of female from above.
E. Head and pronotum of male from above.

a slight median projection. The anterior and median legs are short; all femora moderately robust; the posterior femora are equal to slightly less than half the length of the abdomen in the male, and slightly longer in the female. Tegmina projecting beyond the hind knees by the length of the head and are narrowly rounded apically. The male cerci are simple, acute apically, and somewhat laterally compressed; those of the female are simple.

Antennæ brownish, with the external margin and apex dark blackish brown. Eyes dark brown or black. The front of the head and inferior portions of the genæ light brownish or stramineous; superior portions of the genæ and space between the eyes and the apex of the fastigium black; rest of fastigium and occiput brownish with a faint reddish tinge. The pronotal disc brownish tinged with faint reddish; superior portions of lateral lobes black; inferior portions whitish or brownish yellow; superior portions of pleura black, median portions whitish or brownish yellow, inferior portions and sternites brown. Abdomen yellowish brown, faintly suffused with crimson dorsally; apical ventral segment black. Anterior and median legs yellowish brown. External faces of posterior femora yellowish brown; superior internal faces whitish with angular blackish markings; inferior internal faces crimson; posterior tibiæ dark crimson; tarsi dark crimson. Tegmina blackish, with the basal part of the mediastinal area darker. Wings smoky yellow, with a blackish mottling basally.

Described from three males and one female.

	♂. mm.	♀. mm.
Total length	54	64
„ „ pronotum	5	7
„ „ tegmina	26	35
„ „ post. femora	15	21
„ „ subgenital plate	7·5	..

The main points of difference of this species from *M. laticornis*, Krauss, are as follows:—It is larger and slightly more robust. The front margin of the fastigium is less acute and the eyes are more regularly oval, while in *M. laticornis* the front margin is straight. The frontal ridge is slightly constricted below the median ocellus, and not parallel throughout. The subgenital plate of the male is shorter and the supra-anal plate of the female is rounded apically and not produced. It differs from *M. carinulatus*, Bol. (Mem. Soc. Ent. Belg. xvi. p. 107), in having the anterior and posterior margins of the lateral lobes almost straight and not sinuate and the inferior margins sinuate, while the apex of the supra-anal plate of the female is not produced.

40. *Oraistes luridus*, Karsch.

One ♂, two ♀. Massoka, August.

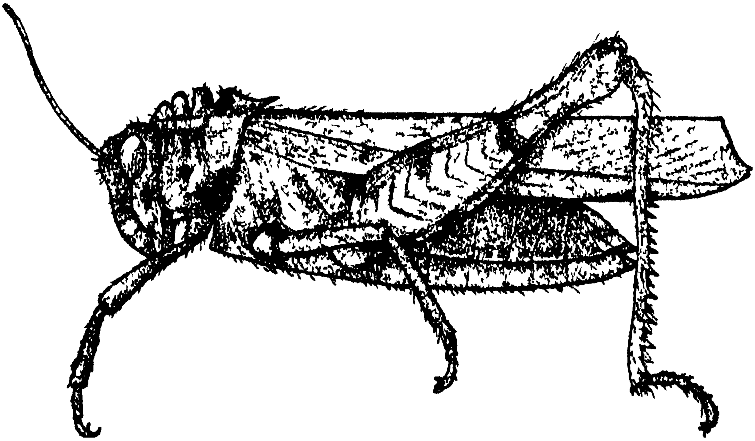
41. *Bocagella lanuginosa*, Bol.

Fairly abundant. December to March.

42. *Exochoderes aurantiacus*, Bol. (Fig. 5.)

Fairly abundant. Very variable in coloration, from pale olive-green with slightly darker green markings to dark brown. August to March.

Fig 5.



Exochoderes aurantiacus, Bol. Female.

43. *Abisares viridipennis*, Burm.

Very abundant. Found chiefly on low trees and bushes. October to January.

44. *Catantops adustus*, Walk.

Not common.

45. *Catantops sulfureus*, Walk.

Generally abundant. July to December.

46. *Catantops maculatus*, Karny.

Very common. July to December.

47. *Catantops tukuyuensis*, sp. n. (Fig. 6.)

Type ♂.

Antennæ thick, not longer than head and pronotum together, feebly compressed. Eyes moderately prominent, oval; distance between the eyes slightly less than greatest fastigial width; height subequal to infraocular portion of the genæ. Fastigio-facial angle slightly less than a right angle, the immediate angle rounded. Face retreating feebly and very coarsely punctured and rugose. Frontal ridge in profile almost straight from the front, margins parallel; ridge sulcate for a short distance below ocellus; supplementary facial carinæ almost straight; occiput feebly rounded. Fastigium descending slightly; fastigium viewed dorsally transverse, broadly rounded in front. Genæ with a feeble diagonal sulcus.

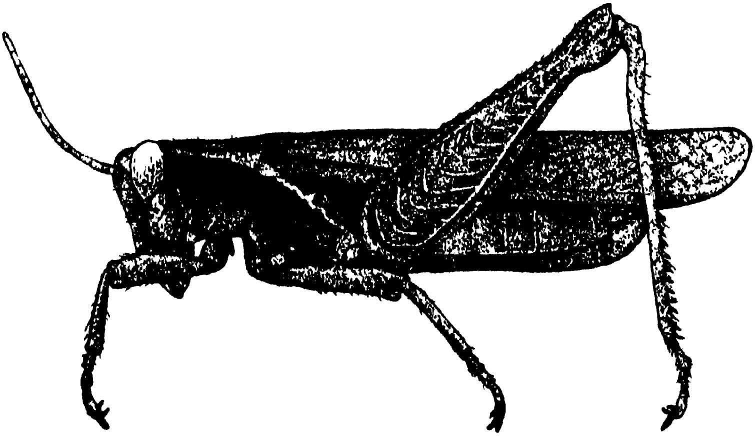
Anterior margin of disc of the pronotum feebly rounded; posterior margin rotundato-angulate; anterior margins of lateral lobes feebly rounded; posterior margins straight; inferior margins irregularly rotundato-angulate. Transverse sulci distinct; prozona subequal to metazona in length. Median carina distinct though very feeble, and almost straight in profile. Surface of pronotum very coarsely rugose. Prosternal spine slightly inclined backwards, subconical, rounded apically, and slightly compressed in transverse direction. Abdomen somewhat compressed laterally and carinate dorsally. The supra-anal plate of the male is scutiform, depressed laterally, and has a median longitudinal sulcus. The subgenital plate of the male conical. The supra-anal plate of the female broadly triangular, rounded apically, and depressed laterally basally; subgenital plate of the female broadly rounded apically and with a median projection.

The male cerci are bifurcate apically, the upper branch of the bifurcation being broad and short, while the lower branch is slightly longer and conical. Those of the female are short, styliform, and hirsute. Tegmina narrowly rounded apically, with the costal lobe moderately distinct.

The posterior femora are relatively thick, with the oblique ridges on the external faces distinct and regular, the genicular arches feebly rounded; the genicular lobes narrowly rounded apically.

Antennæ dark greyish brown, darker apically. Eyes brown, with darker brown lines or spots. Head dark greyish brown. Pronotum greyish brown, with the sides of the disc paler; the lateral lobes are blackish and shiny towards the superior margins, pleura greyish brown. Sternites purplish, with a fine greyish maculation. Abdomen greyish, suffused with dark brown dorsally. Anterior and median legs greyish brown; femora of posterior legs greyish brown, with reddish internal faces and blackish inferior outer faces. Tibiæ of posterior legs reddish, with dirty white spines broadly tipped with black. The two basal joints of the tarsi of the posterior pair are dark reddish and the apical joint is brown. Tegmina greyish, with a fine greyish-brown maculation. Wings pale blue-black, slightly darker apically.

Fig. 6.



Catantope tukuyuensis, sp. n. Male.

Described from two males and nine females.

Moderately abundant. August to February.

	♂. mm.	♀. mm.
Total length	19	24
„ „ pronotum	4	6
„ „ tegmina	16	21
„ „ post. femora	11·5	14

48. *Cardenius nigropunctatus*, Bol.

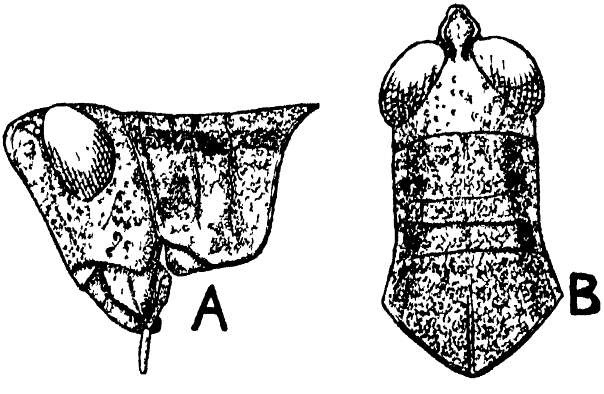
Very abundant. Many individuals strongly spotted on body and legs with purple. August, September.

49. *Anthermus ornatus*, sp. n. (Fig. 7, A & B.)

Type ♂.

Antennæ moniliform, somewhat compressed, more so basally, slightly longer than head and pronotum together. Eyes oval, with the front margins straight; distance between the eyes slightly less than the greatest fastigial width. Fastigium viewed dorsally rather narrowly rounded (♂), more rounded (♀), with a shallow depression, descending feebly. Occiput feebly rounded. Fastigio-facial angle acute, with the immediate angle rounded. Frontal ridge in profile almost straight; from the front subparallel below ocellus, widened above it, with the margins sharp raised. Supplementary facial carina almost straight, but irregularly thickened; surface of head rugulose. Anterior margin of pronotal disc almost straight, emarginate; posterior margin rotundato-angulate; anterior margins of lateral lobes feebly rounded; posterior margins straight; inferior margins broadly rotundato-angulate. Surface of pronotal disc strongly

Fig. 7.



Anthermus ornatus, sp. n.

A. Head and pronotum of male from side.
B. Head and pronotum of male from above.

punctured. Superior margins of lateral lobes with a row of low granules.

Prosternal spine slightly inclined backwards, cylindrical, rounded apically. Abdomen laterally compressed, carinate dorsally; supra-anal plate (♂) subacute apically; lateral margins sinuate, depressed laterally basally, and with a median basal sulcus; subgenital plate (♂) conical, subacute apically; supra-anal plate (♀) considerably compressed laterally, subacute apically, and with a median sulcus; subgenital plate (♀), apical margins feebly concave and with a median projection. Cerci (♂) hairy, bifurcate apically, both forks rounded apically. Cerci cylindrical, but somewhat laterally compressed basally. Cerci (♀) simple.

Tegmina narrow; costal lobe moderately prominent; apices rounded with an oblique truncation. Femora moderately robust; external faces of posterior femora feebly convex; ridges oblique; genicular arches feebly rounded; genicular lobes narrowly rounded apically; inferior margins broadly rotundato-angulate. Posterior tibiæ feebly sinuate. Spines eight in number on external faces, nine on internal faces.

General coloration pale golden-green. Antennæ purplish orange, darker towards apices. Eyes pale purplish, with vertical brown lines. Pronotum with an orange stripe along the lateral carina and dark grey-blue spots on the upper margins of the lateral lobes. Sternites purplish. Abdomen greenish white, with a purplish suffusion dorsally and a paler purplish suffusion ventrally. Femora of all legs pale green. Tibiæ and tarsi of anterior and median legs reddish green. Tibiæ of posterior legs purplish, becoming pale green basally. Spines black apically. Tarsi reddish. Tegmina pale green, suffused with purple in the anal and mediastinal areas. Wings pale violaceous basally, hyaline apically. Whole body, particularly the underside, and all legs covered with soft whitish hairs.

Differs from *A. granosus*, S ål, in its general pale golden-green coloration, and the narrow pale orange or reddish-orange stripes on the lateral carinæ of the pronotal disc which are very distinct. The transverse sulci of the prozona of the pronotum are more distinct, but the median carina is less distinct except on the metazona. The disc of the pronotum is more rounded and narrow. The surface of the pronotum is more strongly punctured, but not granular, except along the superior margins of the lateral lobes, where there is a row of low granules along the orange stripes. Posterior tibiæ purplish, becoming pale green basally. The wings are pale violaceous and more narrow.

This species also differs from *A. violaceus*, described by Bolivar ('Jornal Sciencias Math. Physicas e Naturaes,' Lisboa, ser. ii. tome i. 1889, p. 156), in the absence of black spots from the body and in its pale golden-green coloration. Its smaller size, the absence of the median black stripe on the pronotum, and the absence of black spots from the posterior femora separate it from *A. grammicus* (ibid. p. 157).

August to December. Very common.

Described from twelve males and twenty-four females.

	♂. mm.	♀. mm.
Total length	20	25
„ „ pronotum	4	6
„ „ tegmina	17	23
„ „ hind femora	13	14

50. *Eucoptacra gowdeyi*, Uv.

Common. January, February.

51. *Caloptenopsis ferrifer*, Walk.

Very abundant. July.

52. *Thisoicetrus attenuatus*, Uv.

Very abundant. A long series of both sexes was collected. January.

53. *Tylotropidius gracilipes*, Brancs.

Fairly common. August, October, December, January.

54. *Cataloipidius roseus*, Bol.

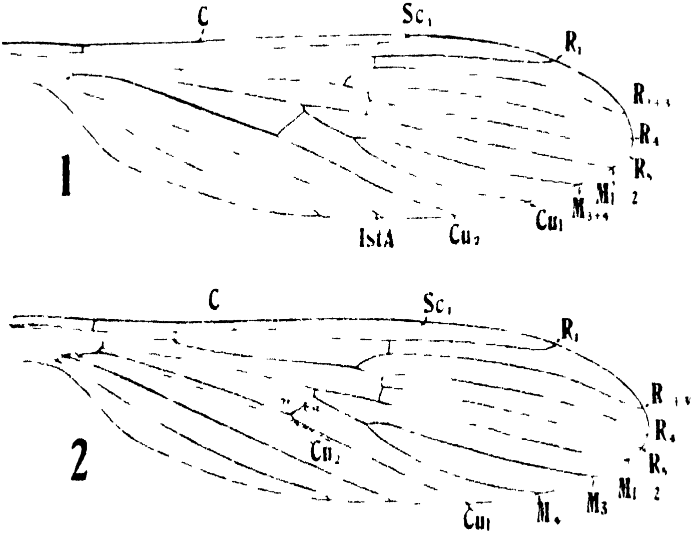
One specimen only. December.

LXXII.—*New or little-known* Tipulidæ (*Diptera*).—XXVIII. *Australasian Species.*

By CHARLES P. ALEXANDER, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

THE species described at this time are all from New Zealand and belong to the Eriopterine genus *Molophilus*. This group of flies is one of the largest and most involved in the Dominion, approximately 80 species having been made known to date. The various species described herewith were collected by Messrs. Campbell, Harris, Myers, and Tonnoir, to whom my sincere thanks are extended for kind co-operation in making known the New Zealand crane-fly fauna. The collections made by M. André Tonnoir are especially rich in small and obscure species. The types of M. Tonnoir's novelties have been returned to him and will be deposited in the collections of the Cawthron Institute and Canterbury Museum.

In this paper and others under this title the writer proposes to adopt the Tillyard modification of the Comstock-Needham system of wing-venation (Proc. Linn. Soc. New South Wales, vol. xliv. pp. 535–718, 1919). The differences involved in this change are illustrated in the accompanying text-figures, fig. 1 showing a *Molophilus* venation interpreted according to the Comstock-Needham system, fig. 2 the same wing with the modifications necessitated by the Tillyard interpretation. From these figures it will be seen that the costal, subcostal, and radial fields are the same in the two systems. The vein called the anterior branch of Cubitus (Cu_1) in the Comstock-Needham system becomes



Wings of *Molophilus tillyardi*, Alexander, comparing the Comstock-Needham system of wing-venation (fig. 1) with the Tillyard modification of the same (fig. 2). A = anal; C = costa; Cu = cubitus; M = media; R = radius; Sc = subcosta; *m–cu* = medial-cubital cross-vein.

the posterior branch of media (M_4) following the Tillyard modification. The basal deflection of Cu_1 of Comstock and Needham becomes the *m–cu* cross-vein. According to Tillyard, only a single branch of *Cu* (Cu_1) reaches the margin of the wing in the Tipulidæ, the posterior branch (Cu_2, fig. 2) being semi-atrophied and lying close behind the main branch of *Cu*, in many cases, however, extending to beyond the *m–cu* cross-vein. This latter vein has been considered as being the degenerate first Anal vein by Comstock and later students, but the writer now feels convinced of the correctness of the Tillyard interpretation of this region of the wing.

Molophilus heteracanthus, sp. n.

Belongs to the *macrocerus* group; mesonotum light yellowish brown, the præscutum with a broad brown median stripe; *m–cu* at fork of *M*; male hypopygium with the basal dististyle a long, slender, acute spine, bearing a smaller spine on the mesal face near one-third the length.

Male.—Length about 3·3 mm.; wing 4·2 mm.

Rostrum and palpi brown. Antennæ of the male elongate, approximately as long as the body; scape brown, the flagellum black; flagellar segments with conspicuous erect verticillate setæ at mid-length of the segments. Head dark brown.

Mesonotum light yellowish brown, the præscutum with a broad, darker brown median stripe; postnotal mediotergite darkened. Pleura dark brown. Halteres pale, the knobs infuscated. Legs with the coxæ and trochanters yellow, the fore coxæ darker; femora yellowish brown, with dark setæ; tibiæ and tarsi dark brown. Wings with a brownish tinge, the veins darker brown; macrotrichiæ brown. Venation: basal section of R_{2+3} relatively short and arcuated; *r* about twice its length beyond the fork of *Rs*; R_{4+5} approximately in alignment with *Rs*; *m–cu* at the fork of *M*; vein *2nd A* moderately elongate, ending about opposite one-third the length of the petiole of cell M_3.

Abdomen dark brown throughout. Male hypopygium with the basal dististyle a powerful, blackened, heavily chitinized spine that is dilated at base, thence gradually narrowed to the acute slender tips; at about one-third the length on the mesal face of the dilated portion a short, slender, gently curved spine, with a brush of short setæ in the axil; beyond this spine the style narrows very gradually to the gently curved tip.

Hab. New Zealand (North Island).

Holotype, ♂, York Bay, Wellington, February 2, 1924 (*J. G. Myers*).

Molophilus myersi, sp. n.

Belongs to the *macrocerus* group; closely related to *M. remotus*, Alexander; basal dististyle of male hypopygium with a conspicuous rounded knob beyond mid-length, the mesal edge of the style densely setiferous, the terminal setæ exceeding the short apical spine.

Male.—Length about 3 mm.; wing 4 mm.

Rostrum and palpi brown. Antennæ elongate, as in the group, but not so excessively so as in some species, approximately as long as the body; flagellar segments with slender apical pedicels of moderate length; antennæ brown throughout. Head brown.

Mesonotum light brown, unvariegated, the pleura somewhat more testaceous. Halteres light brown, the knobs passing into dark brown, the extreme base of the stem obscure yellow. Legs with the coxæ and trochanters obscure brownish yellow; femora pale brown with darker setæ; remainder of the legs passing through dark brown to black on the tarsi. Wings with a pale brown tinge, the veins darker brown though still relatively pale, the macrotrichiæ a little darker. Venation: *Rs* in alignment with R_{4+5}; vein *2nd A* relatively long, ending just before the base of cell M_3, cell *2nd A* relatively long and narrow.

Abdomen dark brown, clothed with yellow setæ. Male hypopygium approximately as in *M. remotus*, Alexander; basal dististyle shortly beyond mid-length produced into a conspicuous rounded knob, the margin of the style with numerous stout setæ that become very dense on the outer face of this knob, on the inner face replaced by dense delicate yellow setæ; beyond this knob the style continues as a flattened blade that gradually narrows to a short, acute, apical spine, the mesal edge with a dense fringe of black setæ that become long and powerful at the apex of the style, projecting caudad beyond the apical spine.

Hab. New Zealand (North Island).

Holotype, ♂, York Bay, Wellington, March 1, 1924 (*J. G. Myers*).

This interesting fly is named in honour of the collector, Mr. John Golding Myers, to whom I am greatly indebted for many favours.

Molophilus subuliferus, sp. n.

Belongs to the *macrocerus* group; general coloration of thorax brown, the pleura darker; antennæ of male shorter than body; vein *2nd A* long; male hypopygium with the basal dististyle a long, slender, gently curved rod that terminates in a long acute spine, the mesal margin armed with two groups of spinous setæ.

Male.—Length about 3·8 mm.; wing 4·8 mm.

Rostrum and palpi dark brown. Antennæ of moderate length, a little longer than the combined head and thorax, dark brown, the basal segment of the scape a trifle paler; flagellar segments swollen, with relatively short terminal pedicels. Head dark brown.

Mesonotum medium brown, the humeral region of the præscutum obscure brownish yellow. Pleura darker brown, shiny. Halteres dark brown, the base of the stem broadly paler. Legs with the coxæ and trochanters yellow; remainder of legs brownish black. Wings strongly tinged with brown, the veins and macrotrichiæ darker brown. Venation: R_{4+5} a little shorter than the basal section of R_{2+3}; vein *2nd A* very long, running generally parallel to vein *1st A*, extending to about opposite the base of cell M_3.

Abdomen dark brown. Male hypopygium with the basistyles obtuse at apex, mesal face near apex with an obtuse fleshy lobe that is directed nearly cephalad. Outer dististyle small, arcuated, with a tiny blackened tubercle near base, the angle of curvature blackened and provided with short erect setæ. Basal dististyle a long, slender, gently curved rod that terminates in a long acute spine; extreme base of style a little dilated and densely set with microscopic erect setulæ; just before mid-length on the mesal margin a group of conical, erect, slender spines; a long row of smaller black spinose setæ on mesal margin shortly before the apex.

Hab. New Zealand (North Island).

Holotype, ♂, Nihotapu, Auckland, February 26, 1923 (*A. Tonnoir*); collector's No. 145 *b*.

Molophilus porrectus, sp. n.

Belongs to the *macrocerus* group; general coloration pale brownish testaceous, shiny, without markings; antennæ of male longer than body; wings with R_{4+5} long; male hypopygium with the basal dististyle a long, slender, unarmed, chitinized rod, the tip acute.

Male.—Length about 2·2–2·4 mm.; wing 4–4·2 mm.

Female.—Length about 2·5 mm.; wing 3·8 mm.

Rostrum and palpi brown. Antennæ of the male longer than the body, dark brown throughout; flagellar segments with slender terminal pedicels, the dilated portions with conspicuous outspreading verticils. Head dark grey.

Thorax pale brownish testaceous, shiny, the margin of the præscutum fading into yellow. Pleura testaceous-yellow, shiny. Halteres brown, the base of the stem yellow. Legs with the coxæ and trochanters testaceous; remainder of legs pale brown, the segments clothed with dark setæ; terminal segments darker. Wings with a pale grey tinge; veins pale brown; macrotrichiæ long and dense, brown. Venation: R_{4+5} in alignment with Rs and very long, about twice the length of the arcuated basal section of R_{2+3}; vein *2nd A* ending some distance before the fork of *M*.

Abdomen brown, the hypopygium paler, yellowish brown. Male hypopygium with each basistyle terminating in a conical tooth-like lobe that is blackened at apex. Outer dististyles two, the more lateral a stout, elongate, conical spine; mesal style blackened, gently arcuated, cylindrical, with the apex obtuse. Basal dististyle a long, generally straight, blackened, chitinized rod that is only feebly sinuous, the extreme tip gently curved and acute, the surface of the style without spines or setæ.

Hab. New Zealand (North Island).

Holotype, ♂, Day's Bay, Wellington, November 29, 1921 (*A. Tonnoir*); collector's No. 144.

Allotopotype, ♀.

Paratopotypes, 2 ♂♂; *paratype*, ♂, Wellington, December 1, 1921 (*A. Tonnoir*).

Molophilus tonnoiri, sp. n.

Belongs to the *multicinctus* group; tibiæ with a single broad white ring; basitarsi white on basal half; wings almost uniformly pale brown.

Male.—Length 2·2–2·4 mm.; wing 3·6–3·8 mm.

Female.—Length about 2·2 mm.; wing 3·5 mm.

Rostrum and palpi brownish black. Antennæ with the basal segment of the scape ochreous; flagellar segments dark brown with elongate verticils and silvery pubescence Head ochreous-yellow.

Pronotum yellow. Mesonotal præscutum reddish brown, the lateral margins conspicuously sulphur-yellow; scutum and postnotum darker brown; scutellum a little brighter.

Ventral pleurites dark brown, the dorsal sclerites a little more reddish; dorso-pleural membrane yellowish. Halteres light yellow. Legs with the coxæ and trochanters brownish testaceous; femora dark brown with a narrow whitish ring near two-thirds the length; tibiæ with a broad, conspicuous, white ring on the basal half, this ring a trifle wider than the darkened base; femoral-tibial joint whitish; tarsi dark brown, the proximal half of the basitarsi obscure whitish. Wings with a pale brown tinge, the veins a trifle darker than the ground-colour; macrotrichiæ brown. Venation: *m–cu* nearly perpendicular to *Cu* at origin; venation otherwise about as in *multicinctus*, Edwards.

Abdomen dark brown, the hypopygium a trifle paler. Male hypopygium very similar in structure to *multicinctus*; head of the longest dististyle compact and more nearly globular.

Hab. New Zealand (South Island).

Holotype, ♂, Mt. Arthur Tableland, Nelson, altitude 4500 feet, December 22, 1921 (*A. Tonnoir*); Collector's No. 169.

Allotype, ♀, Waiho, Westland, January 21, 1922 (*A. Tonnoir*).

Paratopotype, ♂; *paratypes*, ♂, Nelson, Nelson, November 6, 1923 (*A. Tonnoir*); ♂, Lake Brunner, Westland, February 3, 1922 (*A. Tonnoir*).

This very interesting crane-fly is named in honour of Dr. André Tonnoir, to whom I am deeply indebted for the privilege of studying his extensive collections of New Zealand and Tasmanian Tipulidæ.

Molophilus greyensis, sp. n.

Belongs to the *terminans* group; most closely allied to *terminans*, Alexander; pleura indistinctly striped with brown; wings tinged with brown, the veins seamed with darker; male hypopygium with the outer dististyle massive, terminating in three spines or spinous lobes.

Male.—Length about 4 mm.; wing about 4·4 mm.

Rostrum and palpi dark brown. Antennæ short, dark throughout; flagellar segments oval. Head dark, somewhat paler adjoining the eyes.

Pronotum dark brown, paler laterally. Mesonotum dark brown, the humeral region and extreme lateral margins paler. Pleura pale brown, with darker brown longitudinal stripes, the dorsal stripe occupying the dorsal sclerites, the ventral stripe the sternopleurite and hypoepimeron.

Halteres white. Legs with the coxæ and trochanters obscure yellow; remainder of the legs obscure brownish yellow, the tips of the femora and tibiæ vaguely darkened; tarsi broken. Wings tinged with brown, the veins darker brown, seamed with fuscous. Venation: petiole of cell M_3 a little shorter than the basal section of M_{1+2}.

Abdomen brown. Male hypopygium with the dististyles terminal, as in the group; outer style a massive black blade, terminating in a long slender beak, at its base on inner margin with a second appressed spinous lobe, the outer margin of which is weakly spinulose; outer margin of style near mid-length with a stout powerful spine, the margin of the blade distad of this with conspicuous setiferous tubercles. Inner dististyle slender, the basal third dilated, pale brown, the apex long and slender, gently curved, the tip with a few weak denticles.

Hab. New Zealand (South Island).

Holotype, alcoholic ♂, Mt. Grey, Canterbury, February 23, 1924 (*J. W. Campbell*).

Paratopotype, alcoholic ♂; *paratype*, ♂, Purau Creek, Banks Peninsula, Canterbury, February 20, 1922 (*A. Tonnoir*); Collector's No. 178.

Molophilus curvistylus, sp. n.

Belongs to the *terminans* group; mesonotum dark brown, the humeral regions of the præscutum brighter; pleura dark brown; male hypopygium with the outer dististyle strongly curved, chitinized; the apex produced into a spine; inner dististyle weakly toothed at apex.

Male.—Length about 2·8 mm.; wing 4·5 mm.

Female.—Length 3·8 mm.; wing 4·8 mm.

Rostrum and palpi dark brownish black. Antennæ brownish black throughout; flagellar segments oval, with verticils of moderate length. Head dark grey.

Pronotum obscure brownish yellow, darkened laterally. Mesonotal præscutum dark brown, the extreme lateral margins of the sclerite light sulphur-yellow, the humeral triangles brownish yellow; remainder of mesonotum dark brown, the scutellum sometimes a little brighter. Pleura dark brown. Halteres pale yellowish throughout. Legs with the coxæ and trochanters obscure yellow, the bases of the coxæ a trifle darker; femora obscure brownish yellow, with brown trichiæ; tibiæ and tarsi passing into dark brown. Wings with a pale brown tinge, the veins and macrotrichiæ darker brown; a darker seam on the posterior cord. Venation: basal section of R_{2+3} about twice R_{4+5}; vein *2nd A* relatively short, ending about opposite the base of *m–cu*.

Abdomen dark brown, including the hypopygium. Male hypopygium with the outer dististyle stout, blackened, arcuate, the tip produced into a pointed spine, just before the apex on the outer face with a low crest of acute appressed spinules, the style somewhat resembling the head and neck of a crested bird. Inner dististyle longer, the basal half dilated, the apical half suddenly narrowed, gently arcuated, the apex feebly enlarged and weakly toothed.

Hab. New Zealand (South Island).

Holotype, ♂, Nelson, Nelson, October 30, 1923 (*A. Tonnoir*); Collector's No. 173.

Allotopotype, ♀, December 1921 (*A. Tonnoir*).

Paratopotypes, ♂, September 28, 1923 (*A. Tonnoir*); ♂, October 30, 1923 (*A. Tonnoir*); *paratypes*, ♂ ♀, Aniseed Valley, Nelson, March 22, 1922 (*A. Tonnoir*).

Molophilus satyr, sp. n.

Belongs to the *terminans* group; male hypopygium with the outer dististyle a powerful chitinized structure that is provided with an apical beak and two horns, the whole suggesting the head of a faun.

Male.—Length about 3·2 mm.; wing 4 mm.

Rostrum and palpi dark brown. Antennæ dark brown, the flagellar segments oval. Head dark grey.

Pronotum dark brown. Mesonotal præscutum dark brown, the humeral regions a very little paler; remainder of mesonotum dark brown, the sides of the postnotal sclerites paler. Pleura almost black. Halteres pale yellow, the knobs even brighter-coloured. Legs with the coxæ and trochanters ochreous; remainder of legs broken. Wings with a pale brown tinge, indistinctly variegated with darker brown, including seams on the anterior cord, the posterior cord and less distinctly along the sector; veins and macrotrichiæ darker brown. Venation: vein R_5 very thick; vein *2nd A* ending a short distance beyond the base of the petiole of cell M_3.

Abdomen dark brown, including the hypopygium. Male hypopygium with the outer dististyle a very powerful, heavily blackened structure that suggests the head of a faun; the two horns are nearly as large as the powerful terminal spine; one horn broader, acute at apex, the other horn more slender and delicately toothed at base; behind these horns a more blunt lobe that is weakly toothed ; outer margin of style immediately distad of the horns weakly toothed. Inner dististyle slender, dilated and brown at base, the apical half strongly narrowed, arcuate, the apex weakly toothed ; surface of style near mid-length with 4–5 microscopic conical spinulæ in a straight row.

Hab. New Zealand (South Island).

Holotype, ♂, Nelson, Nelson, November 28, 1923 (*A. Tonnoir*).

Molophilus bifalcatus, sp. n.

Belongs to the *terminans* group; general coloration brownish black ; wings narrow, brown ; male hypopygium with both dististyles relatively small, sickle-shaped, the outer one more strongly curved.

Male.—Length 2·8–3 mm. ; wing 3·5 mm.

Female.—Length 3·5 mm. ; wing 4 mm.

Rostrum, palpi, and antennæ black ; flagellar segments short oval. Head dark brown.

Mesonotum brownish black, the humeral region a little paler, reddish brown ; anterior margin of præscutum narrowly, and in some cases very indistinctly, sulphur-yellow. Pleura almost black. Halteres with the knobs elongate, sulphur-yellow, the stems more infuscated. Legs with the coxæ and trochanters obscure brownish yellow ; remainder of the legs yellowish brown with dark setæ, the terminal tarsal segments blackened. Wings narrow, brownish, the veins and macrotrichiæ a little darker brown ; prearcular region a trifle paler than the remainder of the wing. Venation : vein *2nd A* ending but a short distance beyond the base of the petiole of cell M_3.

Abdomen dark brown throughout. Male hypopygium with the dististyles terminal, as in the group ; both styli are relatively small, arcuated, sickle-shaped, their tips acute ; outer dististyle strongly curved and more blackened, the basal two-thirds thickened, the apex produced into a long, slender, acute point. Inner dististyle more flattened and more gently curved, paler, narrowed gradually to the acute apex ; inner or mesal edge near mid-length with about ten small conical spinulæ that produce a roughened appearance at this point.

Hab. New Zealand (South Island).

Holotype, ♂, Nelson, Nelson, October 30, 1923 (*A. Tonnoir*) ; Collector's No. 176.

Allotopotype, ♀.

Paratopotypes, ♂ ♀, October 9–November 28, 1923 (*A. Tonnoir*); ♂, December 3, 1921; ♂, March 4, 1922 (*A. Tonnoir*).

Molophilus reduncus, sp. n.

Belongs to the *tillyardi* group; allied to *M. repandus*, Alexander; male hypopygium with the basal dististyle a relatively flattened blade, the mesal apical angle produced into a long triangular beak.

Male.—Length about 4·5 mm.; wing 5 mm.

Female.—Length about 4·6 mm.; wing 5·5 mm.

Rostrum and palpi dark brown. Antennæ with the basal segment of the scape obscure ochreous, the remainder of the antenna dark brown; flagellar segments oval with moderately long verticils but without conspicuous pubescence. Head grey.

Pronotum dark brown. Mesonotal præscutum obscure reddish yellow with three brown stripes, the median stripe reaching the anterior margin of the sclerite, nearly confluent behind with the lateral stripes; scutal lobes and the scutellum similarly darkened; postnotal mediotergite reddish brown. Pleura brown, indistinctly variegated with paler, especially on the sternites. Halteres pale brown, the stem darker with the extreme base pale. Legs with the coxæ and trochanters obscure yellowish testaceous; remainder of the legs obscure yellow, the terminal tarsal segments passing into brown, the segments with scattered brown trichiæ. Wings with a strong yellowish tinge; veins *C*, *Sc*, and *R* yellowish, the remaining veins darker, indistinctly seamed with brown, contrasting with the background: macrotrichiæ dark brown. Cells Sc_1 and *2nd* R_1 with numerous macrotrichiæ, especially dense along the costa. Venation: basal section of R_{2+3} longer than R_{4+5}; *m–cu* a short distance beyond the fork of *M*; vein *2nd A* ending at or just beyond mid-length of the petiole of cell M_3. Wings relatively narrow.

Abdomen dark brown, the genital segments in both sexes obscure yellow. Male hypopygium as in the *tillyardi* group; basistyle narrowed apically into a relatively long, blackened, spinous tooth, the mesal margin extending basad as a blackened chitinized ridge, the margin of the longer ridge microscopically serrulate, the shorter ridge with a small blackened spine just before its end. Outer dististyle a flattened black blade with the margin delicately and evenly serrulate, at base of style with two long, slender, black spines, one of which is a trifle more curved than the other.

Basal dististyle a flattened blade, dilated at base, the apical portion broadly flattened, the mesal angle running out into a long, triangular, beak-like portion, the outer angle a small obtuse tooth.

Hab. New Zealand (North Island).

Holotype, ♂, Khandallah, Wellington, November 30, 1921 (*A. Tonnoir*); Collector's No. 185.

Allotopotype, ♀.

Molophilus pallidulus, sp. n.

Belongs to the *plagiatus* group; general coloration pale yellow; male hypopygium with the basal dististyle long, slender, curved gently to the apex, the distal half with small appressed spinules.

Male.—Length about 2·6 mm.; wing 3·6 mm.

Female.—Length about 2·8 mm; wing 3·8 mm.

Rostrum and palpi pale brown. Antennæ short, pale testaceous-brown, the outer segments somewhat darker; flagellar segments oval, with conspicuous elongate verticils. Head dark yellow.

Mesonotum reddish yellow without evident darker markings; lateral margins and humeral region of the præscutum more sulphur-yellow. Pleura pale yellow. Halteres yellow. Legs with the coxæ and trochanters testaceous-yellow; femora and tibiæ yellow, the terminal tarsal segments passing into brown. Wings tinged with pale yellow, the veins darker yellow; macrotrichiæ very pale yellowish brown.

Venation: vein *2nd A* ending approximately opposite *m–cu*.

Abdomen yellow, including the hypopygium. Male hypopygium generally similar in structure to *M. morosus*, Alexander. Basistyle terminating in a relatively slender blackened point. Outer dististyle large, widely forked, the lateral arm expanded into a fan-shaped structure, the mesal arm weakly pointed. Basal dististyle long and slender, tapering gradually to the apex, curved gently mesad; about the apical half is blackened, the surface with scattered appressed spinulæ that become larger outwardly, the style terminating in two longer and more slender spines.

Hab. New Zealand (both Islands).

Holotype, ♂, Khandallah, Wellington, November 30, 1921 (*A. Tonnoir*); Collector's No. 150.

Allotopotype, ♀, pinned with the type.

Paratopotypes, ♂ ♀; *paratype*, ♂, Nelson, Nelson, November 6, 1923 (*A. Tonnoir*).

Molophilus curtivena, sp. n.

Belongs to the *plagiatus* group; antennæ of male short; wings relatively narrow, yellowish, the veins a little darker; vein *2nd A* short; male hypopygium with the beak of the basistyle relatively stout; basal dististyle a straight, sparsely spinous rod.

Male.—Length about 2·5 mm.; wing 3·5 mm.

Rostrum testaceous-brown; palpi brown. Antennæ short, brown throughout; flagellar segments oval with relatively long verticils and an erect pale pubescence. Head pale testaceous-brown.

Mesonotum pale testaceous-yellow, without markings, the extreme margin of the præscutum whitish yellow. Pleura light yellow. Halteres pale, the setal covering a little darker. Legs with the coxæ and trochanters testaceous-yellow; femora and tibiæ pale brown with darker setæ; tarsi passing into brown. Wings tinged with yellow; the veins darker yellow, clothed with moderately long brown macrotrichiæ. Wings relatively narrow, especially on the basal half. Venation: anal veins short; vein *1st A* ending about opposite mid-length of the petiole of cell M_3; vein *2nd A* ending some distance before *m–cu*.

Abdomen pale brown. Male hypopygium with the terminal beak of the basistyle relatively stout and high, compressed, the tip acute. Outer dististyle with the stem relatively long and slender, the mesal arm short, subacute, the lateral arm widely expanded, the apical margin smooth. Basal dististyle a straight, relatively stout, pale brown rod that is weakly and sparsely spinous on the distal half, the spines acute, appressed and more crowded at apex. Ædeagus of moderate length, straight, beyond the enlarged base about one-fourth longer than the basal dististyle.

Hab. New Zealand (South Island).

Holotype, ♂, Mt. Arthur Tableland, Nelson, altitude 4500 feet, December 21, 1921 (*A. Tonnoir*); Collector's No. 152.

Paratopotype, ♂; Collector's No. 153.

Molophilus macrophallus, sp. n.

Belongs to the *plagiatus* group; antennæ of the male long, extending to beyond the base of the halteres; wings greyish subhyaline, the base more yellowish; vein *2nd A* short; male hypopygium with the ædeagus long, sinuous, nearly twice the basal dististyle.

Male.—Length about 2·6 mm.; wing 3·9 mm.

Rostrum yellow; palpi dark brown. Antennæ unusually elongate for a member of the *plagiatus* group, if bent backwards extending to beyond the base of the halteres; scapal segments brownish yellow, the flagellar segments uniformly dark brown; flagellar segments elongate-oval to fusiform, with a conspicuous erect pale pubescence. Head dark brown.

Pronotum obscure brownish yellow, darker medially. Mesonotal præscutum brown, the humeral region obscure yellow; scutal lobes brown; remainder of mesonotum more testaceous-brown. Pleura testaceous-yellow. Halteres pale, the stem a trifle darker than the knobs. Legs with the coxæ and trochanters yellowish testaceous; remainder of legs brownish testaceous with dark setæ; terminal tarsal segments dark brown. Wings greyish subhyaline, the basal quarter more yellowish; veins slightly darker; macrotrichiæ dark brown. Venation: *r* nearly in alignment with the basal deflection of R_5; basal section of R_{2+3} arcuated, longer than R_{4+5}; *m–cu* a short distance beyond the fork of *M*; vein *2nd A* short, ending some distance before *m–cu*.

Abdomen brown, the hypopygium a trifle more yellowish. Male hypopygium with the terminal beak of the basistyle relatively long and slender, chitinized. Outer dististyle large, the basal stem unusually stout, mesal arm relatively blunt at apex; lateral arm dilated, the margins nearly smooth. Basal dististyle a moderately long, stout lobe, gently narrowed to the blunt apex, the style infuscated throughout its length, the surface with low appressed teeth that become more numerous and crowded near the apex; mesal edge of style with three spinous setæ, one near one-quarter of the length, one beyond mid-length, and the third just beyond three-fourths the length. Ædeagus very long and slender, gently sinuous, narrowed to the tip, a little less than twice the basal dististyle.

Hab. New Zealand (South Island).

Holotype, ♂, Mt. Arthur Tableland, Nelson, altitude 4500 feet, December 21, 1921 (*A. Tonnoir*); Collector's No. 151.

Molophilus pediformis, sp. n.

Belongs to the *plagiatus* group; general coloration obscure brownish yellow, the thoracic dorsum marked with brown; pleura and postnotum darker brown; male hypopygium with the basal dististyle a foot-shaped chitinized rod.

Male.—Length about 3·5 mm.; wing 4·3 mm.

Rostrum and palpi dark brown. Antennæ relatively short, dark brown throughout; flagellar segments oval with long secund verticils and a long, pale, erect pubesence. Head ochreous-brown, the centre of the vertex somewhat darker.

Pronotum obscure yellow, the lateral margins more infuscated. Mesonotal præscutum reddish brown, the humeral region and extreme lateral margins of the sclerite more yellowish, the disk with three ill-defined darker brown stripes, the scutal lobes similarly darker brown; postnotal mediotergite darker brown. Pleura dark reddish brown. Halteres yellow. Legs with the coxæ and trochanters testaceous-yellow: femora and tibiæ generally yellow, the vestiture of brown setæ scarcely concealing the ground-colour; tarsi passing into brown. Wings with a faint brown tinge, the veins and trichiæ darker brown. Venation: vein *2nd A* relatively elongate, ending just before mid-length of the petiole of cell M_3.

Abdomen dark brown, the hypopygium yellowish. Male hypopygium with the terminal hook of the basistyle relatively deep, flattened, the outer cephalic angle a little produced; one style of the unique type has an indentation near the base of this beak to produce a small basal tooth. Outer dististyle elongate, the mesal arm obtuse at apex, the lateral arm only moderately expanded. Basal dististyle a relatively long rod, the base enlarged, the apex gradually narrowed, just before the tip deflected laterad to form a foot-shaped or beak-like portion; basal half of style pale, the apical half blackened; a few small erect setæ just before the broad acute apex, both on upper and lower margins.

Hab. New Zealand (South Island).

Holotype, ♂, Nelson, Nelson, November 14, 1923 (*A. Tonnoir*); Collector's No. 160 *b*.

The general appearance of this fly is very like *M. morosus*, Alexander, and *M. submorosus*, Alexander, but the structure of the male hypopygium is very different.

Molophilus pugnax, sp. n.

Belongs to the *plagiatus* group; antennæ with elongate verticils and setæ; general coloration obscure yellow; wings tinged with grey; male hypopygium with the basal dististyle a nearly straight rod that is expanded into a head that terminates in a long conical tooth; at base of cone a collar-like ridge bearing a powerful, gently curved, black spine.

Male.—Length about 2·5 mm.; wing 2·6 mm.

Rostrum and palpi brown. Antennæ brown, relatively short, the flagellar segments oval, clothed with long conspicuous verticils and an elongate, erect, white pubescence. Head brown.

Pronotum narrowly infuscated. Mesonotum obscure fulvous-yellow, without markings, the posterior sclerites and pleura more testaceous-yellow. Halteres pale, the knobs light yellow. Legs with the coxæ and trochanters yellow; remainder of legs obscure yellow, the tarsi passing into brown. Wings moderately broad, with a greyish tinge; veins pale; the costal fringe short but dense, yellowish; remaining macrotrichiæ dark brown; anal fringe long. Venation: R_{2+3} with the basal section strongly arcuated, longer than the basal section of R_{4+5}; vein *2nd A* ending shortly beyond the origin of the petiole of cell M_3.

Abdomen brown. Male hypopygium with the basistyle terminating in a relatively stout pale brown beak, the outer margin curved, the inner edge nearly straight. Outer dististyle elongate, the stem unusually long, the mesal arm acute, the lateral arm obtuse at apex but not strongly expanded. Basal dististyle a rather short but stout chitinized rod, narrow at base, suddenly expanded near two-thirds the length into a head, surrounded by a narrow chitinized collar, beyond which the apex narrows to an obtuse cone; mesal face of the collar produced laterad and slightly caudad into a powerful, black, feebly curved, chitinized spine, its tip acute.

Hab. New Zealand (South Island).

Holotype, ♂, Reefton, Nelson, January 13, 1922 (*A. Tonnoir*); Collector's No. 147.

Paratypes, 2 ♂♂, Waiho, Westland, January 30, 1922 (*A. Tonnoir*); Collector's No. 181.

Molophilus harrisianus, sp. n.

Belongs to the *plagiatus* group; general coloration pale reddish brown, the postnotum and pleura darker, more testaceous-brown; male hypopygium with the basal dististyle a powerful, gently curved rod that terminates in a long slender spine, with a second spine on outer face near three-fourths the length.

Male.—Length about 3·3 mm.; wing 3·5 mm.

Rostrum yellowish testaceous, the palpi dark brown. Antennæ short, testaceous, the terminal segments a little darker. Head pale.

Pronotum sulphur-yellow. Mesonotal præscutum reddish brown, the humeral region and narrow lateral margins sulphur-yellow; scutal lobes pale reddish brown; scutellum testaceous-brown, pale posteriorly and beneath; postnotum testaceous-brown. Pleura testaceous-brown, the dorsopleural region paler. Halteres pale, the knobs broken. Legs with the coxæ and trochanters yellow; femora and tibiæ yellow with appressed darker setæ; terminal tarsal segments passing into brown. Wings greyish yellow, the base and costal region clearer yellow; veins pale yellow, not clearly defined against the ground-colour; macrotrichiæ brown. Venation: vein *2nd A* elongate, ending just before mid-length of the petiole of cell M_3.

Abdomen brown, the hypopygium somewhat brighter. Male hypopygium with the basistyle terminating in a slender, acute, chitinized point, directed mesad and slightly cephalad. Outer dististyle bifid at apex, the mesal arm subacute, the lateral arm broadly expanded. Basal dististyle a powerful chitinized rod that is heavily blackened on outer half, gently curved and narrowed to the acute, mesally directed apical spine; at or near three-fourths the length on the outer face with a conspicuous acute spine; between this latter spine and the long apex are several subappressed spinulæ. Ædeagus long and slender, about equal in length to the basal dististyle.

Hab. New Zealand (both Islands).

Holotype, ♂, Mt. Ruapehu, Wellington, altitude 4000–4500 feet, January 20, 1924 (*T. R. Harris*).

Paratypes, ♂, Mt. Arthur Tableland, Nelson, altitude 4500 feet, December 21, 1921 (*A. Tonnoir*); Collector's No. 154; ♂, Waiho, Westland, January 30, 1922 (*A. Tonnoir*).

This interesting mountain-species is named in honour of the collector of the holotype, Mr. Thomas Robert Harris, to whose capable collecting our knowledge of the Tipulidæ of New Zealand is largely due.

Molophilus (?) *ænigmaticus*, sp. n.

General coloration testaceous-brown; wings cuneiformly narrowed, the anal angle reduced; R_{2+3} rectangular at origin; cell *1st* M_2 elongate, closed; *m–cu* its own length beyond the fork of *M*; vein *2nd A* short.

Female.—Length about 1·6 mm.; wing 2·6 mm.

Rostrum and palpi testaceous-brown. Antennæ short, brown throughout, about as long as the thorax; flagellar segments oval with moderately long verticils. Head testaceous.

Thorax of a uniform pale testaceous-brown, rather shiny, without distinct markings. Halteres brown, the knobs darker. Legs with the coxæ and trochanters obscure testaceous-yellow; remainder of legs pale brown, clothed with appressed dark setæ. Wings with a pale brown tinge, the veins and macrotrichiæ a little darker; wings strongly subcuneiformly narrowed, the anal area thus being greatly restricted. Venation: Sc_1 ending about opposite the proximal end of r; R_{2+3} rectangular at origin, the basal section a little shorter than R_{4+5}; r oblique in position; cell 1*st* M_2 closed by the retention of m, the latter less than one-half the arcuated outer deflection of M_3; cell 1*st* M_2 elongate, the proximal end lying far basad of the other elements of the cord; *m–cu* about its own length beyond the fork of M; veins beyond cell 1*st* M_2 elongate; vein *2nd A* short, extending to opposite the origin of Rs.

Abdomen brown, the sternites paler. Ovipositor large and powerful, the valves all well developed; tergal valves rather strongly upcurved, the tips acute.

Hab. New Zealand (South Island).

Holotype, ♀, Dun Mt., Nelson, altitude 3000 feet, January 5–7, 1922 (*A. Tonnoir*): Collector's No. 161.

Paratopotype, sex ?, a broken individual.

The generic position of this tiny fly is somewhat in doubt. Vein *2nd A* is very short, as in the genus *Tasiocera*, but the structure of the antennæ excludes the present species from the latter genus.

LXXIII.—*Some Cheilostomatous Bryozoa from Oran (Algiers).* By ARTHUR WM. WATERS, F.L.S., F.G.S.

[Plate XXXVI.]

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Most of the drawings and descriptions were made some years ago, as I was then hoping to complete a description of a collection of about 80 species from Oran, sent to me by Monsieur Canu. The war came and upset many things, at the time and afterwards. However, in looking for ancestrulæ one was found on *Schizoporella latreillii*, Aud., which led to my completing a corner of the Plate.

This species is important, as apparently it has not been met with since it was figured by Savigny, and the concave front of the zoœcia is most unusual, though this structure has been described by Reuss in a fossil. There are a few species which I have not found in the Northern Mediterranean, but most are old friends, and in several of my papers many have been referred to from Oran.

Beania robusta, Hincks. (Pl. XXXVI. fig. 1.)

Diachoris hirtissima, form *robusta*, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 74, pl. v. figs. 9, 9 *a* (1881).

Beania hirtissima, form *robusta*, Waters, "Bry. from Rapallo," Linn. Soc. Journ. vol. xxvi. p. 17 (1897); "Avicularian Mandibles," J. Micr. Soc. ser. 2, vol. v. pl. xiv. fig. 5 (1885); Bry. Cape Verde Islands, p. 8 (1918); Calvet, Bry. Mar. des Côtes de Corse, p. 10 (1902).

This species from Oran has dorsal spines or radicles, and Calvet, mentioning the same thing from Corsica, says some are bifurcate or trifurcate. Hincks says dorsal surface smooth without spines. The specimen from Napier has the dorsal surface similar to those from Oran.

In the Oran specimens there are, first, three stout distal oral spines directed horizontally, then at the side of the oral region there are two stout spines, the inferior one being somewhat arched. Over the front there are 3–4 delicate spines on each side, as well as a double row of 4–6 at the side directed outwards. There are six rosette-plates, so that each zoœcium is thus attached to all its neighbours, and the way in which this connection takes place at the growing end is most interesting, for at the dorsal surface over a rosette-plate a raised blister is formed (Pl. XXXVI. fig. 1, *a*), and while the growth is quite small a stout spine may grow and the growth from one zoœcium joins with a similar growth on the neighbouring zoœcium. Thus, on this small beginning of a zoœcium, there may be two or three spines; the subsequent growth and attachment to other zoœcia continues until the zoœcium is full grown.

The distal part of the zoœcium is somewhat contracted and raised, so that the dorsal surface of the older part of the zoarium seems formed of a succession of globular zoœcia, a similar appearance being known in several other species.

All the specimens that I have seen are unilaminate, and evidently may form large attached pieces.

In the New Zealand species there are about nine oral spines, then two or three at the side of the oral region. Arching over the front there are very delicate spines, usually about five, though there may be as many as eight, and at the side of the zooecium three rather stouter spines are directed outwards. The differences between the New Zealand and Mediterranean species are that the first has the spines somewhat more delicate, the oral spines more numerous, and the over-arching spines are also more delicate and numerous; on the other hand, the shape of the zooecium and the position of the spines is identical, as are in all respects the avicularia. A new specific name hardly seems called for, and we know that the number of spines varies in other species, some authors having perhaps given undue importance to this character.

The New Zealand form may possibly be intermediate between *B. robusta* and *B. conferta*, MacG., which, however, has very long regular dorsal spines.

Loc. Naples, Capri, Rapallo, Mentone, Corsica, Ajaccio, Bastia; Algiers, under stones (*Hincks*); Oran, 50 met.

Beania hirtissima (Heller).

For synonyms, see Waters, "Bry. of the Cape Verde Islands," J. Linn. Soc., Zool. vol. xxxiv. p. 8, pl. i. fig. 2 (1918), and add:

Beania hirtissima, var. *cylindrica*, Marcus, "Mittelmeer. Bry. aus der Samml. Zool. Berlin," Sitz. bericht. der Gesell. Naturforsch. Freunde z. Berlin, No. 2, p. 73 (1920).

Beania columbiana, O'Donoghue, "Prelim. List of Poly. (Bry.) from the Vancouver Island Reg.," Cont. to Canad. Zool. Biol. vol. i. p. 22, pl. ii. fig. 12 (1923).

From Oran there are some specimens composed of ligulate branches turned over at each side, giving the appearance of being cylindrical, similar growth having been found from several localities in the Mediterranean. Hincks called it var. *cylindrica,* though in no case seen by me is there really a cylinder.

The *Chaunosia hirtissima* described by Busk has also dichotomous branches, and the distal end is contracted as in *B. robusta*, but other differences are so marked that *robusta* and *hirtissima* must be considered specifically distinct. All the spines in *B. hirtissima* are delicate, whereas in *B. robusta* those near the oral aperture are very stout.

Loc. Adriatic, Naples, Capri, Rapallo, Villefranche-sur-Mer, Mentone on *Posidonia.* Cette, 35–70 met. (*C.*), Taranto (*A. W.*), Corsica (*A. W.*), Madeira, Cape Verde Islands, 10 fath., Banks Island, Cape Ebenshaw, Brit. Columbia, 15 fath. Specimen kindly sent to me by Prof. O'Donoghue; Portana Poules, Oran, 50 met.

Lepralia soulieri (Calvet). (Pl. XXXVI. figs. 2, 3, 4.)

Mucronella soulieri, Calvet, Bry. Mar. de la Rég. de Cette, p. 61, pl. ii. figs. 3, 4 (1902); Bry. Mar de Corse, p. 33 (1902).

Smittia (*Mucronella*) *pavonella*, Neviani, Bri. p plioc. di Spilinga, p. 44, fig. 26 (1896); Bri. neog. delle Calabrie, p. 211, pl. xviii. fig. 11 (1900).

? *Umbonula verrucosa*, Harmer, "Morph. of the Cheil.," Q. Journ. Micr. Sci. vol. xlvi. p. 332, pl. xv. fig. 11 (1902).

This belongs to the *Lepralia pavonella*, Alder, group, which occurs under various names in the Tertiaries. *Lepralia semicristata*, Rss.*, fossil from the Miocene of Austria and Hungary, resembles *pavonella*, except that it has six spines. Busk's fig. 1 *a*, of *Eschara sedgwicki*†, is somewhat similar, and apparently he had more than one species before him. Nordgaard ‡ would change *L. pavonella* to *L. arctica*, Sars, but after repeating Sars's description he says that it could not be identified from his short description, though, with Sars's specimens before him, it is at once apparent that it is the *pavonella* of Alder. This is not right, for if the first description has been insufficient, the subsequent name must stand, as no name can claim priority unless sufficiently described or figured, and certainly Sars's description was inadequate.

L. megalota, Rss. §, is also very similar, and is figured with four spines.

L. pavonella is often described as erect, but Alder says adnate as well as in the *Eschara* and *Hemeschara* form, Robertson speaks of its being incrusting or partly free and foliaceous; Harmer would call it *Umbonula*, but this is left open at present.

L. pavonella occurs from Scotland, British East Coast, Dogger Bank, Norway, Sweden, Iceland, Greenland, Spitzbergen, Jan Mayen, California, Brit. Columbia, Queen Charlotte Islands, Vineyard Sound, Wood's Hole (Osburn says, p. 243, with a secondary calcified layer, which often closes the areolæ); also fossil.

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* Oest. Ung. Mioc. p. 151, pl. vi. fig. 6 (1874).

† Crag Polyzoa, pl. x. fig. 1 *a* (1859).

‡ "Rev. av. univ. Samling. av. Norske Bry.," K. Norske Viden. Selsk. Skrifter. p. 6 (1911).

§ Bry. Oest. Ung. Mioc. p. 154, pl. v. fig. 3 (1874).

To return to *L. soulieri* the zoarium is adnate, the zoœcia have pores on the front, as well as round the border, the front is nodular, so that sometimes the pores, sometimes the nodules, are the most noticeable. This is a pleurocyst. From Oran the avicularia are subject to considerable variation, being usually short as figured by Calvet, but occasionally the distal end is prolonged into a beak.

In the fossils from Spilinga *, figured by Neviani as *pavonella*, there are six spines, and sometimes the avicularia are pointed, showing a connection between *pavonella* and *soulieri*.

There are about 19 tentacles in the Villefranche specimens, and no glands have been found. The ovicell of *pavonella* has never been described.

I have specimens of Tertiary fossils from St. Urbano di Mt. Sgreve in which the shape is exactly the same as that of *L. soulieri*, there are large pores round the border and six oral spines. This is *L. semilævis*, Rss. †, and there are ovicells with two large openings as figured by Reuss, whereas in *L. soulieri*, from Villefranche-sur-Mer, the ovicell in a few cases has large pores over the surface more or less radial, as described by Calvet, in other cases there are very large pores—say, four in a row (Pl. XXXVI. fig. 4),—while a large number, perhaps most, have two large pores or openings. *L. semilævis* has a similar ovicell and oral aperture, a mucro, and one or two avicularia by the side of the oral aperture, either short or with an elongate beak, as sometimes occurs in the Villefranche *soulieri*. In *L. semilævis* there is but a single row of pores round the border, and the same is the case in very young growing zoœcia of *soulieri*.

In all probability all forms described as *pavonella* and *soulieri* are derived from *semilævis*, or, if that is not the case, a very close ally must have been the ancestor. First, there is the Northern and British *pavonella*, with a row of few pores round the border, and with no oral spines. From Cette and Villefranche the frontal surface of *L. soulieri* has numerous pores and the ovicell has large pores or two large openings; from Oran only a few ovicells were found, with many large pores.

The large pores referred to are really very wide deep pits, with the base of the pit quite small.

Loc. Cette and Corsica (*Calvet*), Villefranche-sur-Mer (*A. W.*); Oran, 54 fath.

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* Bri. p. pl. di Spilinga, Calabria, p. 44, fig. 26 (1896).

† Reuss, Bry. von Crosaro, p. 270, pl. xxxii. figs. 7, 8 (1869).

Fossil. Spilinga, Postplioc.; Carrubare, Plioc. (*Neviani*); S. Urbano di Monte Sgreve (N. Ital. Tertiarics).

Schizoporella linearis (Hassall). (Pl. XXXVI. figs. 6, 7.)

Lepralia linearis, Hassall, Ann. & Mag. Nat. Hist. vol. vii. p. 368. For synonyms, see Miss Jelly's Catalogue, and add:

Schizoporella linearis, Waters, Avic. Mand. p. 774, pl. xiv. fig. 8 (1885); Levinsen, Danske Dyr. p. 66, pl. v. figs. 44 46 (1894); Calvet, Bry. de Cette, p. 42 (1902); Bry. de Corse, p. 21 (1902); Harmer, Morph. Cheil. p. 301, figs. 48, 52 (1902); Anderson, Bry. Schwed. Exp. p. 541 (1902); Jullien & Calvet, Hirondelle, pp. 78, 136 (1903); Nordgaard, Norw. Fiords, p. 165, pl. v. fig. 26 (1905); Calvet, Travaill. & Talisman, p. 418 (1907); Canu, Bry. Helv. de l'Egypte, p. 210 (1912); Barrosa, "Bri. de la Estac. di Biol. Mar. de Santander," Inst. Nac. di cienc. fis. nat. No. 5, p. 40 (1912); Marcus, "Mittelm. Bry. aus der Sammlung. Zool. Mus. Berlin," p. 81 (1920).

Schizomavella linearis, Cipolla, "Bri. Plioc. di Altavilla presso Palermo," Inst. Geol. del Univ. di Palermo. p. 82, pl. iv. fig. 5 (1921).

From Oran this is met with frequently growing on *Lepralia foliacea*.

There is an important point relating to the large avicularia with a semicircular mandible, which were taken by Hincks to be ovicells, until I showed that they were avicularia, and I now find that Smitt had considered that they might be avicularia. They occur at the beginning of each intercalated longitudinal row of zoœcia, but cannot be considered as vicarious avicularia, since they are situated on the proximal part of a zoœcium. They are found on both the form *typica* and the form *secundaria*, Sm., and in some zoaria it is easy to see that in every case there is one at the beginning of each row, but in other zoaria there is not as much regularity, so that sometimes the position is obscured. Both *typica* and *secundaria* occur from Naples, but only *typica* is found in the collection from Oran.

Hincks* has called the *secundaria*, *inarmata*, but, as Smitt had previously named it, the name he gave should stand.

Regarding the position of the avicularium at the bifurcation of rows of zoœcia, there is one at the bifurcation in *Cuberea boryii*, Aud., and *C. rostrata*, Busk; and I find in some specimens of *Schizoporella discoidea*, from Naples and Rapallo, that the first zoœcium of an intercalated row has, instead of the small semicircular avicularium, a large rounded spatulate one, and this is seldom, if ever, found in any other position. Also[*] I have shown that in several species of *Steganoporella* two zoœcia usually grow from the distal end of a B zoœcium. This is not absolutely parallel with the phenomena in *S. linearis*, Hass., and *S. discoidea*, but it is preparatory to the new row. In *Cribrilina carinata*, W.[†], the vicarious avicularia also occur where a new row is intercalated.

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* Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xiii. p. 41.

The tendency in *S. linearis* is for the zoœcia to radiate from a centre, forming a disk, and the operculum does not close the ovicell.

From Oran there are specimens with the pair of avicularia directed outwards or inwards, while others have a narrow acute central avicularium larger than the pair, and here the mandible may be directed distally or proximally. On account of these variations, which may occur in a single zoarium, several varieties have been created, most of which should be dropped, merely saying that it is a variable species.

Loc. Naples, Capri, Mentone, San Remo, Cette, Corsica, Trieste, Oran, Santander, Vancouver; British, French, and Northern regions.

Fossil. Miocene, Pliocene, Postplioc. N. Italy, &c., Egypt (*Helv.*).

Lepralia foliacea, Ellis & Solander. (Pl. XXXVI. fig. 5.)

See Miss Jelly's Catalogue, and add:

Smittina foliacea, Levinsen, Morph. & Syst. Studies in Cheil. Bry. p. 341, pl. xxiv. fig. 5 (1909).

Eschara bidentata, H. Milne-Edwards, "Recherches sur les Eschares," Ann. Sc. Nat. ser. 2, vol. vi. p. 38, pl. iii. fig. 2 (1836).

Hippodiplosella (sic) *Hippodiplosia foliacea*, Barrosa, "Not. s. Bri.," Bol. Soc. N. H. vol. xvii. p. 496 (1917).

Ovicells have not been described in *L. foliacea*, except by Levinsen, but in connection with this my Oran specimens clear up a most interesting point. Milne-Edwards described as new *L. bidentata*, having much in common with *L. foliacea*, and I have said it was only a synonym of *L. foliacea*, while others have hinted at the same thing. It is now clear that the lateral pointed projections encroaching on the orifice, and upon which the species *bidentata* is based, are only the commencements of the ovicell, extending on each side of the ovicell, the wall of which is rather lower, forming a kind of area. The not much raised ovicell is often abundant on the stage wrongly called *L. bidentata*, M.-Ed., but never occurs on the so-called *L. foliacea*.

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[*] "Bry. from Zanzibar," Proc. Zool. Soc. London, 1913, p. 498; also, Marcus confirms for *S. haddoni*, Harm., Bry. von den Aru Inseln, p. 428; Abh. d. Senckenb. Naturf. Gesellsch. (5) vol. xxxv. (1922).

[†] Waters, Med. and other Cribrilinidæ, p. 570.

Sometimes the small semicircular avicularium below the oral aperture is replaced by a large spatulate one, and the same thing occurs in *L. otto-mülleriana*, Moll., and *Schizoporella auriculata*, &c.

Loc. British, French coasts, Naples, Rapallo, Capri, Villefranche-sur-Mer, Cette, Corsica, Adriatic, Palavas, Stromboli, Almeira (Spain), Atlantic, Alaska, Japan; Oran, 54 fath.

Lepralia complanata, Norman.

Lepralia complanata, Norman, "Brit. Hyd., Act. & Poly.," Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. p. 85, pl. x. fig. 4 (1864); Hincks, *op. cit.* ser. 5, vol. xix. p. 304, pl. ix. fig. 4 (1887); Harmer, "New or Rare Brit. Mar. Poly.," Journ. Mar. Biol. Assoc. n.s. vol. v. p 52 (1897); Calvet, "Bry. Mar. des Côtes de Corse," p. 26 (1902); Barrosa, "Not. sob. Bri. de Tánger," R. Soc. Esp. Hist. Nat. vol. xxiv. p. 294 (1924).

Micropora complanata, Hincks, Brit. Mar. Poly. p. 175, pl. xxiii. figs. 8, 9 (1880).

Membranipora smittii, Manzoni, Bry. foss. Ital. Cont. iv. p. 11, pl. iii. fig. 16 (1870).

Harmer says some of the specimens from the Scilly Islands had the lateral calosities as thick as those figured by Manzoni, but they are absent from the specimens from Oran, though the proximal border is a little raised and thickened, also from the other Mediterranean localities they are absent from the specimens examined by me.

No one mentions ovicells except Norman, and he does not figure any, unless he considered that thickening round the distal border of the aperture was an ovicell. Sections show the larvæ close up to the distal border with a delicate membrane round it forming a chamber for it. This is much the same as in *L. cucullata,* which has no ovicell.

Loc. I found it from Rapallo, Villefranche-sur-Mer, and Oran (45 braccia) and Trieste; Adriatic (*Hincks*), Corsica (*Calvet*); Tangier, B. Mus. 91.6.26 and 9.1.26; Scilly Isl. (*Harmer*).

Fossil. Pezzo, Calabria (*Manzoni*).

Schizoporella latreillii (Audouin & Savigny).
(Pl. XXXVI. figs. 12–15.)

Flustra latreillii, Aud., Descrip. de l'Egypte, Hist. Nat. p. 240; Sav. pl. x. fig. 8.

From Oran a specimen, on a small knob of stone or shell, has the rows of zoœcia radiating all round, so that to the naked eye it looks just like *Lunulites*.

The front of the zoœcium is sunk and concave, giving at first the idea that we are examining the interior of the zoœcium. The oral aperture is rounded on the distal end, and on the proximal border there is a wide sinus, as shown by the operculum (Pl. XXXVI. fig. 13), which closely resembles, both in size and shape, those of *S. unicornis*, Johnst.; *S. biaperta*, Mich.; *S. rimosa*, Jull.; *S. furcata*, B.; *S. divisopora*, Waters; *S. lævigata*, W.; *S. tumida*, Hincks; while *S. marsupifera* is rather wider. There are a number of large pores on the frontal surface, and pores on the lateral wall, much as in *Monoporella tahitiensis*, Waters *. On the distal end, on one side, there is often a chamber as seen when the front is broken away (Pl. XXXVI. fig. 14), and these chambers may be comparable with the bosses on *Membranipora membranacea*. No avicularium, ovicell, or spine has been found.

It is impossible to say with certainty how many spines there are on the proximal border of the ancestrula, which is not in perfect condition, but it does not show any sinus, and probably we may say eight or more spines.

This species does not seem to have been met with since it was first described, but it has much in common with the fossil *Lepralia ogivalis*, Reuss †, from the Miocene of Speising, near Vienna, which also has the front "stark

Schizellozoon imperati (Busk).

Retepora imperati, Busk, Zool. 'Challenger' Exp. Polyzoa, vol. xxx. p. 110, pl. xxvi. fig. 9 (1884); Waters, "Med. and New Zealand *Reteporæ*" Journ. Linn. Soc. vol. xxv. p. 262 (1894).

Retepora tessellata, var. *imperati*, Waters, Zool. 'Challenger' Exp., Suppl. Rep. vol. xxxi. p. 18, pl. iii. figs. 7, 8, 39 (1889).

Retepora tumescens, Ortmann, "Die Japanische Bry.," Archiv f. Naturges. p. 34, pl. ii. fig. 20 (1890).

Schizellozoon imperati, Canu & Bassler, Early Tert. Cheil. Bry. p. 55 (1917).

The Oran specimens have numerous ovicells and large avicularia, and there is a large triangular avicularium at the proximal end of the fenestra. This occurs in a 'Challenger' specimen, also, though not as distinctly, in one sent by Calvet from the Mediterranean.

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* Ann. & Mag. Nat. Hist. ser. 9, vol. xv. p. 342, pl. xxii. fig. 1 *b* (1925).

† Reuss, Bry. Oest. Ung. Mioc. p. 173, pl. vii. fig. 12 (1874).

As a rule there are no spines, and none are mentioned by Busk, but some pieces from Oran have a stout spine at each side of the oral aperture. This occurrence of a spine in some specimens is very interesting.

The species has been mentioned from the Mediterranean by Busk, who does not say from which part, and I have never seen any from Northern Mediterranean, though from Oran it seems to be abundant.

I made a *Retepora tessellata* group * with wide open ovicell, and the operculum with broad thickened border, including *R. imperati*, Busk, *R. solanderia*, Risso, *R. elongata*, Sm., and Canu and Bassler have made the genus *Schizellozoon* with *R. imperati* as the type. I should have been contented for it to remain in the *tessellata* group, as then it is much simpler if further investigation necessitates an altered classification—however, having shown the relationship, I must now accept the genus as made by Canu and Bassler. Certainly *R. solanderia* † must stand in the same genus as *R. imperati*, although there is a difference in the reteporidan pore, which, as Canu and Bassler express it, is replaced by a pseudospiramen. They have also made the genera *Hippelozoon* and *Tryphylozoon*, largely using my detail descriptions ‡, and we have to wait and see whether both are required.

Loc. Azores 450 fath. ('Challenger'); Cape Verde Islands, 100–120 fath. ('Challenger'); Mediterranean ('Porcupine'); Oran, 54 fath.; Japan (*Ort.*).

CELLEPORA. (Pl. XXXVI. figs. 8, 9, 10.)

The shape of the avicularia and the openings are useful in determining the difficult group of *Cellepora*, and the figures show characteristic avicularia. It was intended to extend and amplify this study, but now it must suffice to indicate the importance of a detail study. The question as to whether there are avicularia in a species is not the most important, as there are so many cases where sometimes a species may have them in abundance, at other times there are none.

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* "Reteporæ," p. 262.

† Norman, 'Poly. of Madeira,' p. 301, unites *R. solanderia* with *R. jullieni*, Calvet, but that is through entirely misreading what Calvet wrote, who shows that *R. jullieni* and *R. solanderia* are not the same thing. *Jullieni* is a nom. nov. for *aborea*, Jull., as the name *arborea* had previously been used.

‡ "Med. and New Zealand Reteporæ," Journ. Linn. Soc. vol. xxv. p. 255 (1894); 'Challenger,' Supp. Report, vol. xxxi. pp. 18–22 (1890); "Bryoza," Rés. du Voyage du S.Y. 'Belgica,' p. 77 (1904); "Bry. from Zanzibar," Proc. Zool. Soc. Lond. p. 523 (1913).

EXPLANATION OF PLATE XXXVI.

Fig. 1. *Beania robusta*, Hincks, × 25. Dorsal surface.
Fig. 2. *Lepralia soulieri*, Calvet, × 25. From Oran.
Fig. 3. Ditto, × 85. Operculum.
Fig. 4. Ditto, × 25. Showing ovicells with pits. From Villefranche-sur-Mer.
Fig. 5. *Lepralia foliacea*, Ell. & Sol., × 25. Showing the "*bidentata*" stage, namely, the ovicelligerous zoœcia. It is typical *L. foliacea*. From Oran.
Fig. 6. *Schizoporella linearis*, Hass., × 12. Showing the avicularia at the commencement of a new row of zoœcia. From Oran.
Fig. 7. Ditto, avicularium.
Fig. 8. *Cellepora pumicosa*, var., × 85. Mandible. From Oran.
Fig. 9. *Cellepora coronopus*, B., × 85. Mandible.
Fig. 10. *Cellepora avicularis*, H., × 85. Mandible. From Oran.
Fig. 11. *Schizoporella armata*, Hk., × 85. Operculum.
Fig. 12. *Schizoporella latreillii*, Aud., nat. size.
Fig. 13. Ditto, × 85. Operculum.
Fig. 14. Ditto, × 25. Zoœcia showing corner chamber broken down.
Fig. 15. Ditto, × 25. Ancestrula and surrounding zoœcia.

LXXIV.—*Indian Reticulate Nummulites.* By W. L. F. Nuttall, D.F.C., M.A., F.G.S., The Sedgwick Museum, Cambridge.

[Plates XXXVII. & XXXVIII.]

The fully reticulate Nummulites, with a transverse lamina in the structure of the "filets cloisonnaires," mark an advanced stage in the evolution of the genus in India as in Europe. They are found in rocks of Oligocene age, namely, the Nari Series of Sind and Baluchistan, and at the base of the "Arenaceous Group" of Cutch. There are two species of such Nummulites known in India. One is *Nummulites intermedius*, D'Archiac, with its megalospheric associated form *N. fichteli*, Michelotti. The other is *N. clipeus*, sp. n., and its megalospheric form *N. subclipeus*, sp. n.

Of these species *N. intermedius* is characteristic of the Oligocene, Chattian to Lattorfian of Europe, as well as being found in Borneo, Java, and East Africa. *N. clipeus* has so far only been observed in Cutch State. In India both species are of value in recognizing the age of the Oligocene beds, which frequently are lithologically very similar to Miocene or Eocene strata. The specimens referred to were collected during a geological reconnaissance made by the writer on behalf of the Whitehall Petroleum Corporation, whom he wishes to thank for permitting the publication of this article. The types of the new species have been placed in the Sedgwick Museum, Cambridge.

Nummulites intermedius, D'Archiac. (Pl. XXXVII. fig. 1; Pl. XXXVIII. figs. 1, 2.)

1846. *Nummulites intermedia*, D'Archiac, Mem. Soc. Geol. France, (2) vol. ii. p. 199.
1853. *Nummulites intermedia*, D'Archiac; D'Archiac & Haime, Monographie sur les Nummulites, part of Description des Animaux Fossiles du Groupe Nummulitique de l'Inde, pp. 99-100, pl. iii. figs. 3 *a–d*, 4 *a–f*.
1853. *Nummulites sublævigata*, D'Archiac & Haime, idem pp. 106-107, pl. iv. fig. 8 *a–b*.
1853. *Nummulites acuta*, Sowerby?; Carter, H. J., Ann. & Mag. Nat. Hist. ser. 2, vol. xi. pp. 171-172, pl. vii. figs. 21, 22.
1861. *Nummulites acuta*, Sowerby?; Carter, H. J., Ann. & Mag. Nat. Hist. ser. 3, vol. viii. pp. 376-378.
1871. *Nummulites subbrongniarti*, Verbeek, R. D. M., Neues Jahrb. f. Min., Geol. u. Pal. pp. 6-9, pl. i. fig. 2 *a–b*, pl. ii. pars, Form B.
1879. *Nummulites sublævigata*, D'Arch. & Haime; Blanford, W. T., Mem. Geol. Surv. Ind. vol. xvii. pp. 10, 49-53, &c.
1879. *Nummulites sublævigata*, Medlicott, H. B., and Blanford, W. T., Geology of India, pt. ii. p. 460, pl. xv. figs. 11, 11 *a*.
1883. *Nummulites sublævigata*, Blanford, W. T., Mem. Geol. Surv. Ind. vol. xx. pt. 2, p. 70.
1889. *Nummulites sublævigata*, Carter, H. J., Ann. & Mag. Nat. Hist. ser. 6, vol. ii. p. 211.
1905. *Nummulites subbrongniarti*, Verbeek; Douvillé, H., Bull. Soc. Geol. France, (4) vol. v. pp. 442–444.
1906. *Nummulites intermedius*, D'Arch.; Vredenburg, E., Rec. Geol. Surv. Ind. vol. xxxiv. pt. 2, pp. 90–91, 94.
1908. *Nummulites intermedius*, Pilgrim, G. E., Rec. Geol. Surv. Ind. vol. xxxvii. pp. 143, 144, 147.
1908. *Bruguieria intermedia*, D'Arch., Form B; Silvestri, A., Boll. d. Soc. Geol. Ital. vol. xxvii. pp. 632-642, pl. xxi. figs. 8, 10, 11, 12.
1909. *Nummulites intermedius*, D'Arch.; Vredenburg, E., Palæontologica Indica, n.s. vol. iii. Mem. no. 1, Table opp. p. vi.
1911. *Nummulites intermedius*, D'Arch.; Boussac, J., Le Nummulitique Alpin. Mem. pour. serv. à l'explic. la Carte Geol. détail. France, pp. 84-88, pl. i. figs. 4, 5, pl. iv. fig. 3.
1914. *Nummulites intermedius*, Cotter, G. de P., Rec. Geol. Surv. Ind. xliv. pt. 1, pp. 56, 58.

The Indian form of this species has been described by Messrs. D'Archiac and Haime as *N. sublævigata*, but these authors failed to make a sufficiently critical examination of the "filets cloisonnaires," and in consequence incorrectly placed this Nummulite in their sub-reticulate group. Professor Douvillé has kindly lent me a specimen of *N. sublævigata* from D'Archiac's collection, and I have obtained a photograph of a thin section made from this specimen (Pl. XXXVII. fig. 1). This section has been cut immediately above the median cell-layer, as is also the case in the specimen of *N. clipeus* (Pl XXXVII. fig. 2). By this means it is possible to study the arrangement of the "filets cloisonnaires," showing their young and adult development in one specimen. The filets are seen to be at first simple radiate around a single small median pustule, and very soon a reticulate structure appears, due to transverse laminæ cutting across at right angles to the radiate filets (forming what Boussac terms a "réseau mixte"). Later the filets anastomose, and a completely irregular reticulation of fine mesh is formed. This reticulation is identical with that found in many specimens from Europe, some of which, however, show greater variation than is found in India, by possessing a larger mesh or a more radiate structure. The filets are indistinguishable from *N. subbrongniarti* of Java and Borneo, which has been considered as synonymous with *N. intermedia* by Douvillé and Boussac. The Indian form differs only from the European by having a larger adult development.

Carter has described this species from India as *N. acuta*, Sowerby (?). The type of one of Sowerby's figured specimens (Trans. Soc. Geol. Lond. ser. 2, vol. v. pl. xxiv. fig. 13, the top right-hand specimen) is preserved in the British Museum (Natural History). It is quite different to *N. sublævigata*, the exterior of young specimens, such as the above type of *N. acuta*, being covered with strong granulations. The specimens of *N. acuta* that I have collected are only from the Eocene Kirthar Series, and are not found in the Oligocene beds of Cutch. In 1861, Carter refers to *N. sublævigata* the specimens which formerly he doubtfully ascribed to *N. acuta.*

I have collected numerous specimens of *N. intermedius* from Western India in which I have observed the following characteristics of size and internal structure, the "filets cloisonnaires" being as in D'Archiac's specimen described above. The average diameter is 15 to 16 mm. and thickness 3 mm. The maximum diameter observed is 29 mm. The average ratio of diameter to thickness is 5·5 to 1. The test is flat, with the thickness decreasing little from the centre to near the periphery, the border being sharp.

Internally there are six whorls in the first millimetre, about 17 in a radius of 6 mm., and 23 in a radius of 8 mm. The number of septa is very variable, there being more where the whorls are closer together than where they are far apart.

In one quadrant of the 7th whorl there are from	4-7 septa.
8th	5-9
9th	6-15
10th	7-15
11th	7-15
12th	7-17
13th	11-21

The species occurs, together with its megalospheric form *N. fichteli*, in the Nari Limestone of Sind and Baluchistan and at the base of the "Arenaceous Group" of Cutch. I have examined specimens from the following localities:—(*a*) Kumbhi and other points in the Bugti Hills, Baluchistan; (*b*) Bibi Nani, Bolan Pass, Baluchistan; (*c*) East of Sari, Thana Bula Khan Taluqa, Karachi District, Sind, associated with *Lepidocyclina* cf. *dilatata*, Michelotti, and *Pecten lævi-costatus*, Sowerby; (*d*) From 2 miles north of Aida, also ½ mile S.E. of Sehe, and 1 mile south of Kari, Western Cutch, occurring with *N. clipeus* and *P. lævi-costatus*.

Nummulites fichteli, Michelotti. (Pl. XXXVIII. fig. 1.)

1841. *Nummulites fichteli*, Michelotti, G., Mem. Math. e Fis. Soc. Ital. d. Scienze in Modena, vol. xxii., Parte Fisica, p. 296, pl. iii. fig. 7.

1848. *Nummulites garansiana*, Joly & Leymerie, Mem. de l'Acad. des sci. Toulouse, ser. 3, vol. iv. p. 214, pl. i. figs. 9-12, pl. ii. fig. 8.

1853. *Nummulites fichteli*, Mich.; D'Archiac & Haime, *loc. cit.* pp. 100-101, pl. iii. fig. 5*a*.

1853. *Nummulites garansensis*, J. & L.; D'Arch. & Haime, idem. pp. 101-102, 344, pl. iii. figs. 6*a*, 7*a*-*g*.

1871. *Nummulites subbrongniarti*, Verbeek, *loc. cit.* pars, Form A.

1908. *Bruguieria intermedia*, D'Arch.; Silvestri, A., Form A, *loc. cit.* pp. 643-650, pl. xxi. figs. 9, 13-16.

1911. *Nummulites intermedius*, D'Arch.; Boussac, Form A, *loc. cit.* pp. 84-88, pl. iii. fig. 12.

This species is the megalospheric form of *N. intermedius*, and in India is always found accompanying it. The specimens that I have examined are fairly globose lenticular with a sharp border. Externally they are smooth, except where the exterior shell-lamina has been removed by surface-weathering, when the typical reticulate structure of the filets as in *N. intermedius* may be observed. The diameter varies from 4·5 to 3·3 mm., the average diameter being 3·6 mm. The thickness varies from 1·5 to 1·0 mm., the average being 1·2 mm. The average ratio of diameter to thickness is 2·9 to 1.

Internally there are about 6 whorls on a radius of 1½ mm. In one quadrant of the second whorl there are from 3 to 4 septa, in the third 4 to 6, in the fourth 6 septa. The diameter of the primordial chamber varies from 290 to 370 μ; it is single and subcircular in cross-section.

Nummulites clipeus, sp. n. (Pl. XXXVII. fig. 2; Pl. XXXVIII. figs. 3–5.)

Description. Test moderately flat lenticular with a sharp border. The average diameter is 13 mm. and thickness 3 mm., the average ratio of diameter to thickness being 4·4 to 1. The maximum diameter observed was 29 mm. The central portion often has a slightly raised, wide, ill-defined mamelon. Over 150 specimens of this species were examined, and two were found to be very globose with a prominent mamelon, the external measurements of these specimens being diameter 16·6 mm., thickness 6·8 mm., diameter 10·9 mm., thickness 6·0 mm. A thin section shows that the reticulate filets are different to those of *N. intermedius*. Near the centre they are thicker and more closely set together, and also in the peripheral portion they are more radiate and possess irregular concentric transverse laminæ (compare Pl. XXXVII. figs. 1, 2).

In the median chamber layer there are from 16 to 17 whorls in a radius of 6 to 7 mm. and 28 whorls in a radius of 12 mm. The width of the spacing between the first six whorl-walls gradually increases, and then is practically uniform for the remaining whorls, being throughout more regular in thickness than is found in *N. intermedius*. The whorl-lamina is thick, and the septa are inclined at an angle of 30 to 80 degrees to it. The septa are slender, and in the adult part of the test are normally nearly straight, but occasionally irregularly curved, and usually not quite reaching the interior margin of the chamber. Their number, which is as follows, is less than in *N. intermedius*:—

In one quadrant of the 5th whorl there are from 4–5 septa.
" " 6th " " 4–6 "
" " 7th " " 4–7 "
" " 8th " " 5–7 "
" " 9th " " 5–7 "
" " 10th " " 5–7 "
" " 11th " " 6–7 "
" " 12th " " 7
" " 13th " " 7

Near the centre the width of the chambers is approximately equal to their length, and near the periphery the chambers are two or three times as long as wide.

Occurrence. This Nummulite has so far only been found in Western Cutch. The rock in which it occurs is the local equivalent of the Nari Series of Sind, and consists of about ten feet of white to creamy-yellow marly and occasionally glauconitic limestone at the base of the "Arenaceous Group" of Wynne, immediately above the contact with the Kirthar Limestone (see Mem. Geol. Surv. Ind. vol. ix. 1869, pp. 78, 252, 259). *N. clipeus* is abundant in these beds, and occurs together with the megalospheric form described below, which generally is the commoner of the two, there being north of Aida about five times as many megalospheric individuals as microspheric in a sample of the rock. It is found associated with *N. intermedius* and *Pecten lævi-costatus*, Sowerby. The localities from which I have specimens are 2 miles N. of Aida village and ½ mile S.E. of Sehe, 1 mile S. of Khari, Western Cutch.

Nummulites subclipeus, sp. n. (Pl. XXXVII. figs. 3–5.)

This Nummulite is the megalospheric form of the species just described, with which it was found associated. Its average diameter is 5·5 mm. and thickness 1·6 mm., the average ratio of diameter to thickness being 3·4 to 1. The maximum diameter observed was 6·7 mm. and thickness 1·9 mm. It possesses a prominent apical mamelon, shown well in the figured specimens, and the border is sharp. The filets are identical with those of the microspheric form Internally there are 9 whorls in a radius of 2·7 to 3 mm. The whorl-laminæ and septa are similar to those of the microspheric form, and the width of the whorls increases uniformly. The primordial chamber is single with a diameter of 250 to 360 μ. The number of septa is as follows:—

In one quadrant of the 2nd whorl there are 3 septa.
" " 3rd " " 4 "
" " 4th " " 6 "
" " 5th " " 6 "
" " 6th " " 6 "

The species is readily distinguished from *N. fichteli* by possessing a prominent apical mamelon, and by having whorls which are closer together and more numerous than in the Indian forms of the latter species.

EXPLANATION OF THE PLATES.

Plate XXXVII.

Fig. 1. Thin section, showing reticulate "filets cloisonnaires" of *Nummulites intermedius*, Mich. (This is a specimen of D'Archiac's collection from Sind, described in 1853 by Messrs. D'Archiac and Haime as *N. sublævigata*, lent by Prof. H. Douvillé from the Museum of the École de Mines, Paris.) × 5.

Fig. 2. Thin section, showing reticulate "filets cloisonnaires" of *Nummulites clipeus*, sp. n., 2 miles north of Aida, Cutch. × 10.

Figs. 3, 4. Exterior view of *N. subclipeus*, sp. n. Fig. 3, Holotype. Same locality as fig. 2. × 5.

Fig. 5. Thin equatorial section of *N. subclipeus*, sp. n. Same locality as fig. 2. × 5.

Plate XXXVIII.

Fig. 1. Exterior view of *Nummulites intermedius*, D'Arch., with *N. fichteli*, Mich., attached. From Bibi Nani, Bolan Pass, Baluchistan. × 4.

Fig. 2. Thin equatorial section of *N. intermedius*. Same locality as fig. 1. × 5.

Fig. 3. Exterior view of *N. clipeus*, sp. n. Holotype. From 2 miles north of Aida, Cutch. × 5.

Fig. 4. Equatorial section of *N. clipeus*, sp. n. Same locality as fig. 3. × 5.

Fig. 5. Transverse thin section of *N. clipeus*, sp. n. Same locality as fig. 3. × 10.

LXXV.—*A new Genus of African* Muridæ *allied to* Leggada.

By Oldfield Thomas.

In a collection of Congo Muridæ, obtained by Père R. Callewaert in the Lualaba District, Southern Congo, there occurs a single specimen of a mouse showing in essential characters a relationship with *Leggada* and restricted *Mus*, but with a highly-modified muzzle, the incisors being thrown forward, just as they are in certain isolated genera in other groups in different parts of the world. In Africa this character occurs in the genus *Muriculus* as compared with its relative *Lophuromys*, but has not been recorded in the *Mus-Leggada* group.

The new form may be called

Hylenomys, gen. nov.

General external characters about as in *Leggada*, though the snout in life is probably more elongated. Fur intermixed with spines, but not profusely so. Pollex with a nail, not a claw. Fifth hind toe short, not reaching to the base of the fourth. Tail shorter than head and body, of normal Murine hairiness. Number of mammæ unknown.

Skull with a long muzzle and smooth oval brain-case, its upper outline strongly convex. Supraorbital ridges slightly developed, but forming distinct beads. Zygomatic plate normal. Anterior palatal foramina very long, broader anteriorly than in the middle, their hinder edge level with the middle of m^1; posterior palatal foramina unusually long, as long as m^2. Choanæ as in *Mus* and the majority of the species of *Leggada*, not narrowed or closed up. Pterygoid region narrow, the ectopterygoids parallel with each other, not widely divergent. Bullæ comparatively rather large. Lower jaw with low coronoid process, and scarcely perceptible capsule over the root of the incisors.

Incisors narrow, quite remarkably thrown forward, among the most proodont of the Muridæ, the incisive index in the type-specimen 101°, as compared with 84° in a normal orthodont *Leggada*. In a *Muriculus*, also very proodont, it is 99°. Edge of incisors with distinct evidence of the notch occurring in *Leggada* and typical *Mus*. Lower incisors with long needle-like points. Front face of incisors practically without pigment, the upper white, the lower very faintly yellowish. Molars essentially as in *Leggada*, the inner cusp of the anterior lamina of m^1 much pushed backwards, so that the two outer cusps give the same impression of a long narrow bicuspid lobe projecting in front; but there is no supplementary cusp on the lobe.

Genotype:

Hylenomys callewaerti, sp. n.

Size and general appearance that of a large *Leggada*. Fur short, close, hairs of back about 6 mm. in length, intermixed with fine spines. General colour above uniform mouse-grey, not buffy or rufous. Under surface dull whitish, the bases of the hairs slaty. Head coloured like the back, without special markings. Ears short, brown. Hands and feet white. Tail brown above, so far as the skin is concerned, but most of the hairs are whitish; below dull whitish, not sharply contrasted.

Hab. South Congo; type from Luluabourg, Lualaba. Alt. 610 m.

*Type**. Adult female. B.M. no. 25. 4. 2. 1. Original number 452. Collected 29th May, 1924, and presented by Père R. Callewaert. One specimen.

This remarkable little animal is clearly a highly-specialized proodont form of the *Mus* and *Leggada* group, and has no near relationship with any other members of the family, as is indicated by its external appearance, the structure of its molars, and its notched incisors. It is readily recognizable by its very characteristic proodont incisors, such as occur in *Muriculus* among the *Lophuromys* group in *Zelotomys*, and in *Chilomys* among S. American Murines, but in very few others of the true Muridæ, most of the proodont rodents being specialized fossorial forms, such as *Georychus* and its allies, *Spalax*, and others. In these, however, the proodont incisors are, no doubt, used as a digging organ, which I do not think is the case in the Murine forms now referred to. What this special object can be we have at present no information, and must await further observation, but, as most of the species are excessively rare, the modification does not seem to have been a very great success. Possibly it is for the purpose of seizing grubs or other insects.

In all other respects *Hylenomys* is absolutely like a *Leggada*.

Père Callewaert is to be congratulated on the discovery of a very interesting new rodent, and I have much pleasure in connecting his name with it.

LXXVI.—*A new Australian Mouse of the Genus* Pseudomys.

By Oldfield Thomas.

In 1922 a number of mice from a "mouse-plague" in South Australia were sent to Prof. Wood-Jones of Adelaide, and in going over these recently he found that, while as usual the great majority were *Mus musculus*, there was among them a single specimen of a native mouse, and this he has sent to me for determination.

It proves to be a new member of the *Leggadina* subgenus of *Pseudomys*, that group only containing a very few species, of which the best-known is the beautiful little *Ps. delicatulus* of North Australia, figured by Gould.

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* Owing to the close resemblance of the animal to a species of *Leggada* which we know occurs in the same locality, I think it wise formally to nominate the skull as the type, in case any mistake might have been made in its allocation to the skin.

The new form may be called

Pseudomys (*Leggadina*) *messorius*, sp. n.

Size greater than in *delicatulus* and *patrius*, less than in *forresti*, about as in *hermannsburgensis*. General colour above sandy-buffy, below whitish, the bases of the hairs slaty, their ends white or yellowish, though the latter colour may be due to spirit-discoloration. Hands and feet white. Tail slightly shorter than head and body, pale brown above, whitish below, not sharply contrasted.

Skull in general shape about as in *hermannsburgensis*, the interorbital region narrow, the brain-case broad, low, smoothly rounded; supraorbital edges sharply square, but not beaded. Palatal foramina long, reaching to the level of the anterior third of m^1, very narrow behind. Bullæ medium, smaller than in *hermannsburgensis*, larger than in *patrius*.

Incisors orthodont, with index 82°, about as in *forresti* (80°), those of *hermannsburgensis* and *patrius* more opisthodont (62°, 64°); anterior molar with distinct anterior cingular cusp.

Dimensions of the type:—

Head and body 67 mm.; tail 53; hind foot 17; ear 13.

Skull: greatest length 23·5; condylo-incisive length 22·7; zygomatic breadth 13; nasals 8; interorbital breadth 3·6; brain-case, breadth 11·2; palatilar length 11·5; palatal foramina 6; length of bulla, measured parallel with the general axis of the skull, 4·1; upper molar series 4·5.

Hab. Melrose, Spencer Gulf, South Australia.

Type. Adult male. B.M. no. 25. 4. 9. 1. Presented by Prof. F. Wood-Jones.

This pretty little mouse is readily distinguishable from *Ps. hermannsburgensis*, its nearest ally, by its longer and narrower palatal foramina, its shorter bullæ, and more orthodont incisors, and by its intermediate size from the other members of the subgenus.

The systematic position and characters of the genus *Pseudomys* and subgenus *Leggadina* are given in a paper on Australian Murines, published in 1910*, and it will be seen that no other members of *Pseudomys* approach the present one so nearly as the species of *Leggadina* above referred to.

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* Ann. & Mag. Nat. Hist. (8) vi. p. 603 (1910).

All these native mice being on the verge of extinction, owing to the irruption of *Mus musculus*, it is always a pleasure from the scientific standpoint to save one of them from total oblivion; and we are, therefore, grateful to Prof. Wood-Jones for sending home this interesting specimen. Some further examples of the species have also been obtained at Woolawatana, near Lake Frome.

LXXVII.—*Descriptions of new Forms of* Delias, *with some Notes on Others.* By Lord ROTHSCHILD, F.R.S.

Delias agostina infumata, Fruhst.

This name was given by Fruhstorfer to the specimens from Assam and Tenasserim, but I cannot see any difference from the examples of *a. agostina* from Northern India. I compared 14 ♂♂ 2 ♀♀ with 26 ♂♂ and 12 ♀♀ from N. India. Therefore *A. infumata* falls as a synonym of *a. agostina.*

Delias agostina annamitica, Fruhst.

This race, on the other hand, is quite distinct, being smaller and paler, the ♀♀ having above the stripes between the nervures and in the cell more pronounced and whiter, and the hind wings yellowish cream-colour, not deep orange-buff.

Delias rothschildi rothschildi, Holl.

D. rothschildi is quite a distinct species and NOT a subspecies of *D. dorimene*, as stated by Fruhstorfer in Seitz, Macrolep.

Delias rothschildi ariela, Niep.

This insect, described by Herr Niepelt as a distinct species, and said to be from Timor or some neighbouring island, is evidently a subspecies of *D. rothschildi*, which occurs on Buru. It differs above principally in the greater extent of white on the fore wing and below by the absence of orange on the marginal and tornal areas of the hind wing.

(1) *Delias dumasi*, sp. n.

It is most extraordinary that three such closely allied species as *rothschildi*, Holl., *apatala*, Joic. & Talb., and the present one should occur on Buru.

♀. Above differs from *apatala* and *rothschildi* in the almost entirely brown-black fore wings, the basal ⅓ being only faintly freckled with paler scales, a little more thickly below vein 1. On the hind wing the colour is buffish cream, NOT greyish white; the inner margin of the black outer ⅔ of the hind wing is deeply indented and crenulated, NOT straight. Below the fore wing differs in having the first three of the five apical spots brightly yellow, NOT white. and in having a white quadrate spot between veins 8 and 9 at the end of the cell; the hind wing differs in the black marks in outer ¼ being heavier and wider, and in being clear yellow with no orange or brownish suffusion, nervures white.

Expanse 74 mm. Length, fore wing 35 mm.

Hab. 1 ♀, Mount Mada, Buru, 3000 feet, Sept. 1898 (*Dumas coll.*).

(2) *Delias hyparete panayensis*, subsp. n.

♂. Above differs from *h. mindorensis*, Fruhst., in having the light apical spots in fore wing sharper and large, thus approaching *h. palawanica*, Stdgr., and the marginal area of hind wings showing the dark underside, though much less distinctly. Below it is nearer *h. mindanaoensis* in having only the three lower red spots on the marginal area of hind wings and a minute red dot below vein 7; the fore wing below is nearest to *h. lucina*, Dist.

♀. Above is nearest to *h. palawanica*, but the white is much more extended. Below it is nearest to *h. luzonensis*, but differs in the apical spots of the fore wing being yellow and the more uniform yellow of the disc of hind wing.

Hab. 1 ♂, 1 ♀, Panay, Philippine Islands, 1909 (*E. Wahr coll.*). (Type ♂.)

(3) *Delias sambawana everetti*, subsp. n.

♂. Above differs from both *s. sambawana* and *s. minerva* in the purer white of the fore wings and the more creamy tinge of the hind wings, from *a. sambawana* it also differs in the very sharply and clearly defined black margin to the hind wing.

Below it differs from both the other subspecies in the clear deep orange-yellow of the hind wings, the much reduced black basal scaling of the hind wings, and the much larger scarlet patches; on the fore wings it differs in the clearer yellow of the enlarged subapical spots and in the much greater amount of white in the discal area of the fore wings.

♀. Above differs from *s. sambawana* in the creamy-yellow, not white, markings; and from *s. minerva* in these markings being broader.

Below it differs from both the other subspecies in the clear yellow apical spots of fore wing, the intense orange-yellow of the hind wing, and the much larger scarlet patches, one ♀ has the cream markings above much extended.

Hab. 26 ♂♂, 4 ♀♀, South Flores (dry season), October 1896 (*Everett coll.*). (♀ type.)

(4) *Delias argenthona insularis*, sp. n.

♂. Above differs from *a. argenthona* in its less pure white colour.

Below differs strongly, the fore wings have the subapical spots less than half as large as in *a. argenthona* and the yellow at base almost absent; on the hind wings the yellow basal area is more extended and clear yellow, NOT golden orange, and the red patches which in *a. argenthona* occupy almost the whole black outer area are in *a. insularis* reduced to a row of quadrate submarginal spots.

♀. Above has all the pale areas white, NOT sulphur-yellow; the subapical spots are smaller and the base and cell are only slightly suffused with grey; on the hind wing the large pale spots are absent, only being indicated by whitish points or dots. Below the subapical spots of the fore wing are smaller, and the red patches reduced to quadrate spots, though larger than in the ♂.

Hab. 1 ♂, 1 ♀, Daru Island, British New Guinea; 1 ♂, labelled Brit. N.G.," but also no doubt from Daru Isl. (type ♂, Daru Isl.). (A characteristie of this race is that the red discocellular stigma is entirely separate, while in *a. argenthona* it is joined to the submarginal red patches.)

(5) *Delias sacha gilolensis*, subsp. n.

♂. Above differs on fore wing from *s. sacha* in the much larger coalescent subapical spots almost obliterating the black apex, and on the hind wing in the absence of the broad black margin, it being only indicated by slightly thinner white scaling than on the disc.

Below it differs in the hind wing being on the disc, instead of entirely clear yellow with orange suffusion in tornal region, pale lemon-yellow on basal $\frac{3}{5}$ with a broad outer white patch between veins 3 and 7 and a large deep orange patch running in from tornus to basal $\frac{1}{5}$ of wing; the black outer area is much broader and the lunate submarginal spots are much reduced, very narrow, and brilliant scarlet, NOT orange as in *s. sacha*.

♀. The ♀ of *s. sacha* is unknown, so I cannot give a comparative description of that sex of *s. gilolensis*.

Above sooty-black, basal $\frac{1}{2}$ more or less suffused with whitish scaling, on the fore wings a row of six white subapical spots and on the hind wings five white quadrate marginal spots.

Below basal $\frac{1}{2}$ obliquely of fore wing whitish grey, basal $\frac{1}{4}$ and median nervure greenish yellow, rest brownish black; an apical-submarginal row of seven spots, the first two sulphur-yellow, the rest white; hind wing basal $\frac{1}{3}$ greenish yellow, outer $\frac{2}{3}$ brownish black, a row of six large wedge-shaped orange submarginal patches.

Hab. 1 ♂, 1 ♀, Halmaheira (*Waterstradt coll.*). (♂ type.)

(6) *Delias bagoë restricta*, subsp. n.

♂ ♀. Differ on underside from *b. bagoë* and *b. nusana* in the white area at the lower portion of the fore wing being more extended and the scarlet-crimson band of coalescent patches on hind wing being much reduced.

Hab. 3 ♂ ♂, 3 ♀ ♀, New Hannover, March 1923. (*A. G. Meek*). (Type ♂.)

Delias vidua, Joic. & Talb.

Delias vidua, Joicey & Talbot, Bull. Hill. Mus. vol. i. No. 2, p. 304, no. 8 (1922) (Buru).

Messrs. Joicey and Talbot described this species from a single ♀, and I now have much pleasure in describing the ♂ from 4 examples captured by the late W. Doherty.

♂. Above resembles the same sex of *D. isse echo*, but has a broader dark margin to hind wing and the rest of that wing is much less white, more grey.

Below the fore wing is clear yellow, NOT white, as in *i. echo*; hind wing has nearly a third, NOT barely $\frac{1}{4}$, of a clear, not greenish, yellow, the submarginal spots are pale yellow, NOT ORANGE-RED.

Hab. 4 ♂ ♂, Kayeli, Buru, March 1897 (*W. Doherty coll.*).

Delias gabia and its races.

Much of the confusion complained of by Messrs. Joicey and Talbot under their description of *gabia aurantiimacula* (Bull. Hill. Mus. i. 2, p. 305) was due to my having unfortunately put my *flavidior* down as *zarate flavidior.* The fact is that *flavidior* is a subspecies of *Delias omissa* and not of *gabia*, of which *zarate* is a somewhat poorly distinguishable subspecies. Fruhstorfer's *gabia mavronaria* is in my opinion identical with *zarate*, Gr.-Sm. I have compared 40 ♂♂, 21 ♀♀ of *zarate*, including the type, with 15 ♂♂, 2 ♀♀ of *mavronaria.*

(7) *Delias pheres hyperapproximata*, subsp. n.

All the forms of *pheres* show little difference on the upper side, with the exception that in *pheres pheres* a considerable proportion of the ♀♀ are suffused strongly with buff.

♂♀. Below differ at first sight from *ph. pheres* and *ph. approximata* in having the basal pale area yellow, NOT white; on the hind wings the yellow patches are smaller, and the extreme forms of the female have a white disc without any yellow patches.

Hab. 8 ♂♂, 4 ♀♀, Rawlinson Mts., inland from Huon Gulf, N.E. New Guinea. (Type ♂.)

(8) *Delias orphne tahanica*, subsp. n.

♂. Differs above from *o. orphne* in its larger size, more pointed fore wing, and in the much greater white suffusion on apex and outer marginal ¼ of wing, also reduced discocellular stigma.

Below the fore wings are much blacker and the submarginal white spots larger; on the hind wing the yellow is more extended and paler, the dark portions being reduced.

Expanse—*o. tahanica*, 70 mm.; length, fore wing 33 mm.
o. orphne, 62 mm.; „ „ „ 29 mm.

Hab. 1 ♂, Mount Jahan, Malay Peninsula (*Waterstradt coll.*).

(9) *Delias mira reversa*, subsp. n.

♂. Above differs from *m. mira* by having more white on the basal half of the fore wings and less white on the basal ⅔ of hind wings; on the fore wings there are five subapical spots instead of two.

Below differs by the much smaller extent of pale yellow on the lower ⅓ of hind wing and in the absence or obsolescence of the dark patch between veins 1 and 2. The Sattleberg ♂, however, has this patch more strongly indicated than have the two Rawlinson ♂ ♂.

Hab. 1 ♂, inland from Sattleberg, 1500 m., 2 ♂ ♂, Rawlinson Mts., inland from Huon Gulf (*Keysser coll.*).

Delias bornemanni, Ribbe, and its races.

This species was described by Ribbe in 1900 from examples captured by Emil Weiske on the Aroa River, British New Guinea, and the type (or one of the types) is in the Tring Museum; in 1911 Dr. Jordan described a subspecies *bornemanni nais* from Mt. Goliath, Dutch New Guinea, from specimens collected by A. S. Meek; in 1915, Eecke described from some part of Dutch New Guinea a form he named *bornemanni rubrina*, which is the same as *bornemanni nais*. In addition, the Tring Museum has two other races, one in ten examples from Biagi, Mambare River, N. of the Central Range, S.E. New Guinea, collected by A. S. Meek, and the other also in ten examples from the Rawlinson Mts., inland from Huon Gulf, N.E. New Guinea, collected by Keysser. The Rawlinson Mt. form is apparently undescribed.

Delias bornemanni ægle, Joic. & Talbot.

Delias nais ægle, Joic. & Talbot, Bull. Hill Mus. vol. i. pt. 2, p. 310, no. 13 (1922) (Biagi).

♂ ♀. Differ from *b. bornemanni* by its much duller red colour on hind wings below and the larger red spots and their greater extent; from *b. nais* it differs above in the less extent of white on the fore wing and the wider black margin to the hind wing.

Hab. 6 ♂ ♂, 4 ♀ ♀, Biagi, Mambare River, Jan.–April 1906, 5000 ft. (*A. S. Meek*).

(10) *Delias bornemanni keysseri*, subsp. n.

♂. Differs from both *b. ægle* and *b. nais* in its very dull red underside and above in the greyish-white, NOT cream-white, pale areas; the extent of these pale areas being intermediate between the two.

Hab. 9 ♂ ♂, 1 ♀, Rawlinson Mts., inland from Huon Gulf (*Keyser coll.*).

(11) *Delias meeki septentrionalis*, subsp. n.

♂ ♀. Below differs from *m. meeki* and *m. neagra* in the basal $\frac{3}{5}$ of the fore wings and the subapical spots being fiery-orange, not pale yellow, and in the costo-discal white patch on hind wings being splashed with orange, not yellow, an orange dot is below this patch and the post-discal line orange, NOT yellow.

Hab. 1 ♂, 2 ♀ ♀, Rawlinson Mts., inland from Huon Gulf (*Keyser coll.*).

(12) *Delias oraia adonarensis*, subsp. n.

♀. Differs from *o. lydia*, Fruhst., above by the basal $\frac{2}{3}$ of wing forming the pale disc being much more defined and with much less dark scaling in the cell. Below it differs in the orange basal $\frac{1}{3}$ being much less clearer, less greenish, and with much less strong suffusion of dark scales.

Hab. 3 ♂ ♂, 1 ♀ (♀ type), Adonara, Nov. 1891; 3 ♂ ♂, 3 ♀ ♀, Pura, Oct. 1891 (*W. Doherty coll.*).

Delias oraia oraia, Doh., and *D. oraia vasumitra*, Fruhst.

I have compared a long series of examples from Sambawa with an almost equally long series from Lombok, viz. 28 ♂ ♂, 21 ♀ ♀, from Sambawa, and 23 ♂ ♂, 14 ♀ ♀, from Lombok, and I am unable to confirm the distinctions given by Fruhstorfer—in fact, my darkest ♀ specimen with the smallest marginal spots is among the Sambawa ♀ ♀, while the palest with the largest marginal spots is from Lombok; therefore *o. vasumitra*=*o. oraia.* In the three subspecies remaining it is only in the ♀ ♀ that the differences are found; *o. oraia* having no clearly defined pale disc on the hind wing, whereas *o. adonarensis* has one sharply marked, and *o. lydia* is somewhat intermediate.

(13) *Delias eximia*, sp. n.

This splendid insect is unlike any other species.

♂. Above white, apex of fore wings obliquely to tornus and almost to discocellulars, and a broad border to hind wings (narrowest at costa) black.

Below black; thorax and base of wings greenish yellow, cell below median vein, and between cell and costa of fore wing brilliant scarlet; hind wing with a brilliant scarlet splash between costa and cell in basal $\frac{1}{2}$ of wing.

Expanse 67–72 mm. Length of fore wing 31–33½ mm.

Hab. 10 ♂ ♂, New Ireland, December 1923 (*A. F. Eichorn*).

LXXVIII.—*On Three North African Zygænas.*

By Lord Rothschild, F.R.S.

In 1917 I described a *Zygæna* under the name of *marcouna excelsa* (Nov. Zool. xxiv. p. 340. no. 32 (1917), and figured Nov. Zool. xxvi. pl. i. ff. 12, 13 (1919)) from the Djebel Mekter, Ain Sefra, West Algeria. In 1922 the late Charles Oberthür described from the Middle Atlas a *Zygæna* under the name of *alluaudi* (Etud. Lépid. Comp. Fasc. xix. pt. 1, p. 159, pl. dxlv. pp. 4583, 4584).

When I described the Djebel Mekter insect I paid more attention to the colour of the wings and the pattern of the fore wings than to other points, and so I overlooked the principal character—namely, the wider margin of the hind wing with the central inaugulation instead of the plain narrow marginal line of *marcouna*. Therefore *excelsa* is not a local subspecies of *marcouna*, but a distinct and separate speci s.

Now, on comparing the series caught by Dr. Hartert on the Djebel Mekter during our joint visit to Ain Sefra, 84 in number, with the 5 ♂ ♂ of Mr. Oberthür's *alluaudi*, it became quite clear that they belong to the same species; though at first glance three points of difference seem to exist, viz.: (1) The W. Algerian series appears larger; (2) the Moroccan specimens appear to have wider black margins to the hind wings; and (3) the Moroccan examples appear to have the more scarlet ground-colour of *Zygæna algira*, Dup., rather than the crimson of *Z. marcouna*. On closer examination, however, these three apparent differences disappear, for, looking closely at the West Algerian series, it is seen that only three or four ♂ ♂ are larger than the largest two of the Moroccan set, and the apparent larger effect is produced by the ♀ ♀, of which there are none from Morocco. Then the wider black margins are also a delusion, for two only of the five Moroccan examples have wider margins than the bulk of the series from West Algeria, whereas the other three have these margins exactly as in the majority from Djebel Mekter, and one Djebel Mekter ♂ has the widest margins of all. Lastly, as to the more scarlet colour, two of the Moroccan examples are as crimson as the general run of the West Algerian series, while three or four of the smaller Djebel Mekter ♂ ♂ are almost as scarlet as the type of *alluaudi*. Therefore the fact cannot be gainsaid that *Zygæna marcouna excelsa*, Rothsch., and *Zygæna alluaudi*, Oberth., are one and the same insect, and as it is a distinct species from *marcouna* and my name has five years' priority over Mr. Oberthür's, the species must stand as *Zygæna excelsa*, Rothsch. In 1923 Monsieur Le Cerf described under the name of *Zygæna ungemachi* an insect from Oulmés, "Morocco" (Bull. Soc. Entom. France, 1923, p. 200), describing it as being close to *Z. loyselis*, Oberth., but with a much hairier abdomen without any trace of abdominal pink ring, the abdomen and legs being entirely black.

Dr. Hartert in 1924 captured a series of 49 *Z. ungemachi* which agreed with M. Le Cerf's diagnosis almost exactly, but while all the ♀ ♀ and a few ♂ ♂ had black legs a number of ♂ ♂ had some white on the INSIDE of the tibiæ and femora. In the Oberthür collection are two *Z. loyselis* (*fide* Oberthür), collected by Monsieur Alluaud in the Great Atlas, which differ from *ungemachi* in having distinct traces of red abdominal rings on the sides, though NOT dorsally, and, moreover, they have rather more white inside and a little also on the outside of the femora and tibiæ. In *Z. loyselis occidentalis*, Oberth., from the Oranais, W. Algeria, the legs are mostly black outside and white inside, but the wings have bright scarlet markings; in *Z. loyselis loyselis*, Oberth., the legs are white inside and pale horn-colour outside, and like *ungemachi* and the Grand Atlas *loyselis* the markings of the fore wings are dirty pink.

Finally, in the *loyselis* form from Azrou, which I described recently in the 'Moroccan Journal of Natural Science' under the name of *Z. ungemachi montana*, the abdomen and legs are entirely black and the red of the collar and tegulæ is replaced by black except two minute pink dots on the patagia. This being so, I consider, as no two of these forms occur together, that all five are local races of *Zygæna loyselis*, Oberth. I herewith describe the Grand Atlas form.

Zygæna loyselis fracticingulata, subsp. n.

Differs from *Z. l. ungemachi* in having the red abdominal ring present on the sides of the abdomen, but not dorsally or ventrally, and the legs slightly marked externally with white or pale horn-colour.

Hab. Grand Atlas, Morocco (*Alluaud coll.*).

The forms of *Z. loyselis* therefore stand as follows :—

Zygæna loyselis loyselis, Oberth., E. Algeria.

Zygæna loyselis occidentalis, Oberth., West Algeria.

Zygæna loyselis fracticingulata, Rothsch., Grand Atlas, Morocco.

Zygæna loyselis ungemachi, Le Cerf, West Morocco and Mts. west of Middle Atlas.

Zygæna loyselis montana, Rothsch., Middle Atlas.

P.S.—Since writing the above, I have had the opportunity of examining 4 ♀ ♀ examples of the *loyselis* group of *Zygæna* collected by P. Rotrou at Taza, N.E. of Fez, in Morocco. These specimens are again different from the five above-named races of *loyselis*; they have olive-green, NOT grey, fore wings with the spots and stripes of a dark crimson, and reduced in size so that the four outer spots are quite separate and the two basal ones represented by two separate streaks; the hind wings are more or less strongly clouded with dark olive-green, and the abdomen and thorax are deep black with no abdominal ring; the patagia and the outermost fringe of the tegulæ are deep crimson. I name this the sixth form of *loyselis*:

Zygæna loyselis olivacea, subsp. n.

LXXIX.—*Two new Orthoptera from British Guiana.*

By B. P. UVAROV

Family **Acrididæ**.

Phæoparia havilandæ, sp. n.

♂.—Similar to the Colombian *Ph. amblyceps*, Heb., in the rudimentary elytra, but scarcely closely allied to it.

Antennæ reaching well beyond the base of hind femora. Head slightly thicker than pronotum and only slightly ascendant. Frontal ridge percurrent, sulcate throughout, seen in profile somewhat rotundato-prominent between antennæ, and very slightly depressed at the ocellum. Lateral facial carinæ well developed, though not very regular, straight. Whole face in front of the lateral carinæ coarsely punctured. Maxillary palpi with the apical joints laminate, slightly dilated. Vertex strongly sloping, its lateral ridges high, curved, the apex not marginate, median carinula well developed, disappearing on the occiput. Interocular distance about half again as broad as the basal joint of antennæ. Head above obsoletely rugulose. Cheeks with an oblique row of punctures and moderately densely, though rather coarsely, punctured near the lower margin.

Pronotum compressed laterally, with the disc rounded, and not forming angles with the lateral lobes; the whole surface coarsely rugulose and punctured. Anterior margin slightly ascending, with subobsolete short longitudinal ridges. Transverse sulci deep. Metazona measured along its middle about as long as the distance between the second and third sulcus. Median carinula low, but distinct throughout. Hind margin with a broad obtusangular excision, the sides of which are broadly convex. Lateral lobes much longer than deep, strongly narrowed anteriorly; anterior margin very strongly oblique, slightly convex; anterior angle very obtuse; lower margin ascending in more than its anterior half, rounded-prominent behind; posterior angle obtuse; posterior margin distinctly concave. Prosternal spine fairly stout, narrowly conical, with the apex blunt. Mesosternal interspace distinctly narrower than long.

Elytra entirely lateral, very narrow, widened towards the apex, reaching the apex of the first tergite.

Abdomen above rugulose and coarsely punctured, with a sharp median ridge.

Hind femora with the upper median carina bearing low but sharp serrulations and a short denticle apically; outer upper carina with less numerous and smaller serrulations. Hind tibiæ without the outer apical spine.

Furcula represented by fairly long, slightly incurved, tapering appendages, their distance being subequal to the length of one of them. Cerci broad, laterally compressed, suddenly narrowed in the apical third, bearing a low triangular tubercle just before the apex. Supra-anal plate with the proximal (broad) portion longer than wide; a pair of stout teeth is placed at the very base of the apical portion; the latter is distinctly longer than broad, its sides slightly convergent to a point behind the middle, the apex circular; the median sulcus well developed in the basal half, where its margins are raised, and the surface of the plate sideways is concave. Subgenital plate not produced behind, broadly rounded-truncate apically.

Coloration above pale yellowish-olivaceous, head and pronotum more reddish brown. Antennæ bright reddish brown basally, black in the rest. Cheeks and mouth-parts black, only the maxillary palpi whitish. Lateral pronotal lobes black above, gradually fading to castaneous downwards. Pleuræ olivaceous-brown. Elytra black, except narrow upper margin, which is yellowish. Underside shining black. Front and middle legs bright reddish brown. Hind tibiæ greenish olivaceous on the outer face, bluish black below and inwardly. Hind tibiæ black.

Total length 21; pronotum 4; elytra 3·8; hind femora 14 mm.

The type and three male paratypes are amongst an interesting lot of Orthoptera collected at Kartabo, British Guiana, June–July 1922, by Miss M. D. Haviland (Mrs. Brindley), and presented by the authorities of the Newnham College, Cambridge, to the British Museum.

The species may be compared only with *Ph. amblyceps*, Heb., from Colombia, as all other members of the genus possess well-developed wings, but it differs from that species by the structure and sculpture of head and thorax, shape of elytra, and coloration.

Family Tettigoniidæ.

Topana cornuta, sp. n.

♂.—Eyes globose, very prominent. Fastigium of vertex deeply sulcate, suboval, acuminate apically, open behind; just behind its base there is a small acute spine directed obliquely forwards.

Pronotum with the disc flat posteriorly and gently convex anteriorly, all margins distinctly raised, smooth, the lateral ones lowered in the middle portion. Anterior margin straight, lateral ones gently sinuate, hind margin circular. Along the middle of the disc runs a fine impressed line bifurcate in front. Lateral lobes higher than long, with the anterior margin straight and hind margin broadly rounded.

Elytra with the hind margin straight for about three-fourths of its length, the apex elliptical. Wings with the apex subacuminate.

Anterior femora armed with four spines below on the anterior margin, the first spine being very small and the following ones gradually increasing in size. Intermediate femora with five very small spines below on the anterior margin. Hind femora with two rather large laminate spines on each side before the apex below, and some minute spinules along the outer lower carina.

Cerci hirsute, strongly arcuate, apex bi-spinose, the outer spine being short, the inner one long, acute, both spines straight. Subgenital plate oval, truncate apically, with short styli.

General coloration pale green. Head pale yellowish grey, with small dark dots; vertex ivory-white. Antennæ whitish, annulated at broad intervals with narrow blackish rings. Disc of pronotum greenish yellow, with some irregularly placed, pale olivaceous, lichen-like spots; hind margin narrowly castaneous; lateral lobes blackish in the upper half, ferruginous in the lower, their margins narrowly whitish, the hind one alternately black and testaceous. Pleuræ testaceous. Elytra pale green, with the stridulating organ, the anterior basal portion of the costal field, some small spots along the anterior margin, and an irregularly quadrangular spot beyond the middle, brown. The free portion of the wings of the same colour as elytra, with the costal margin and a series of small spots along it brownish. Abdomen yellowish testaceous, with indistinct dark lateral fasciæ in the apical half. Front and middle legs greyish white, with indistinct grey fasciæ; hind legs greenish yellow, with the subbasal third of femora and their apex greyish brown, while the tibiæ are indistinctly fasciated with fuscous.

Total length 13; pronotum 4; elytra 19·5; wings 22; hind femora 12 mm.

The unique type is from Takatuni River, British Guiana, June 1919, *A. A. Abraham*, and it has been presented by the Imperial Bureau of Entomology to the British Museum.

The species is highly remarkable for its spined vertex.

BIBLIOGRAPHICAL NOTICES.

Birds of Ceylon. By W. E. Wait, M.A., F.Z.S., M.B.O.U. Pls. xx., 496 pp. Published for the Government of Ceylon by 'The Times of Ceylon' Ltd. 15*s.*

In the 'Birds of Ceylon' Mr. Wait has given us a most excellent Handbook to the Avifauna of an area not dealt with as an individual whole since the publication of Legge's 'Birds of Ceylon' in 1880. The classification adopted is that outlined in the new edition of the 'Avifauna of the Indian Empire' now appearing, an arrangement which will facilitate search and comparison and which is, perhaps, as sound as any yet suggested. In a preface Mr. Wait gives an admirable description of the Island of Ceylon, whilst the map which accompanies it is full of information, giving elevations and rainfall in addition to the usual contents.

The letterpress is a model of what Handbooks should be, the Ceylon Government having wisely allowed the author ample space in which to describe both the bird and its habits at length. In consequence, we obtain good and sufficient descriptions of the species and subspecies dealt with, with most interesting accounts of their nidification and life-history. Mr. Wait has not hesitated to quote freely from works already published but he has added an immense amount of information obtained, for the most part, from his own constant and accurate work in the field. His research into the histories of specimens in the Colombo Museum has been exhaustive and necessitates the admission of further species and genera to the Avifauna of Ceylon.

The plates, in black and white, are quite good enough to fulfil their object, *i. e.*, assistance to the student in the identification of the birds he meets.

We congratulate Mr. Wait on having completed a book, very badly wanted, in a manner both scientific and interesting.

British Birds. Vol. I. By A. THORBURN.
48 pls., 176 pp. Longmans, Green & Co. 16*s.*

MR. THORBURN in this book presents us with a small replica of his large first edition, published in 1915 and already out of print. In any work by Mr. Thorburn one naturally accepts the plates as the principal object of the work and these, of course, are excellent in every respect, whether one regards them as works of art or as representations of the birds themselves. The life-like attitudes of the birds, their beautiful surroundings and the artistic treatment of each plate cannot but appeal to everyone who sees this book; certainly it will make them look forward with pleasure to the succeeding three volumes which will complete the work. As regards the letterpress one cannot pretend it is on a par with the plates. The nomenclature adopted is not up to date and is therefore often incorrect, whilst the author seems satisfied that nothing new has been recorded about birds since the last generation of naturalists passed away. A good instance of this is the author's treatment of White's Thrush. This he calls *Turdus varius.* If he objects to admitting subspecies, he should call it *Turdus dauma*, and if he admits subspecies he must call it *Turdus dauma aureus.* Having given the bird a wrong name he then proceeds to paint another subspecies from the Philippines and, finally, he says "little appears to be known about its egg or nesting-habits," though a very short research among modern authors would have given him all the information required.

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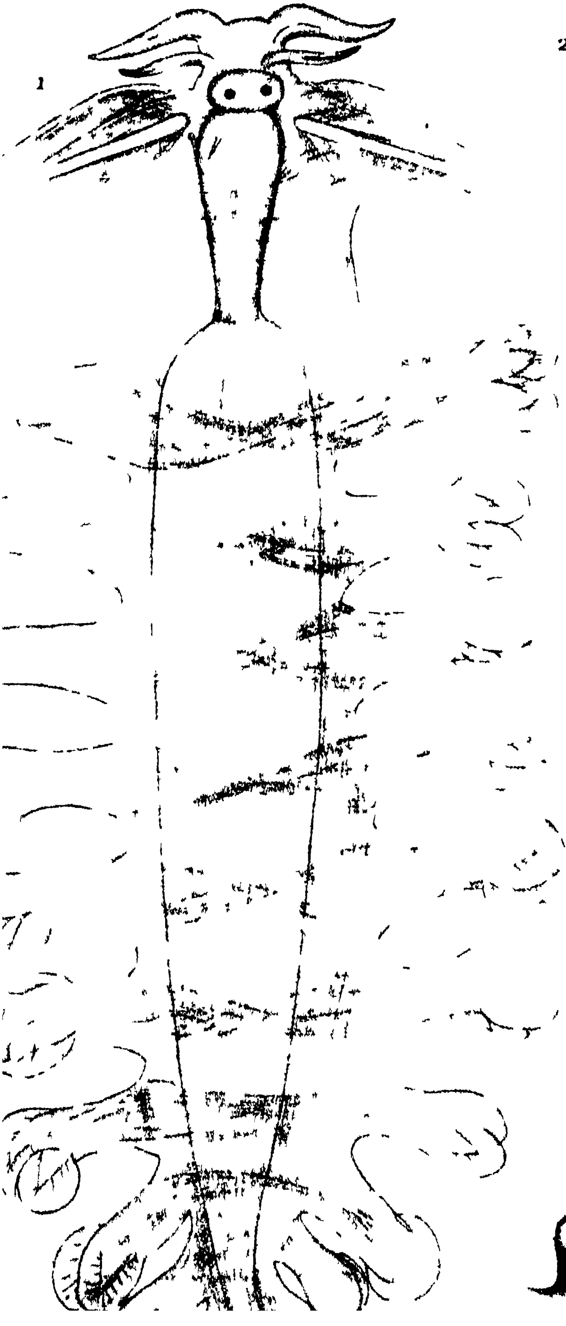

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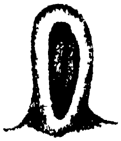

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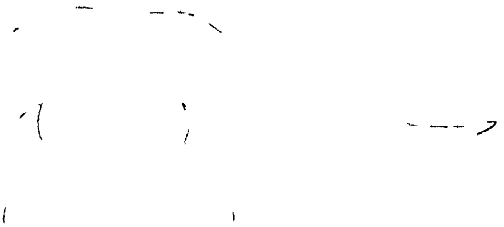

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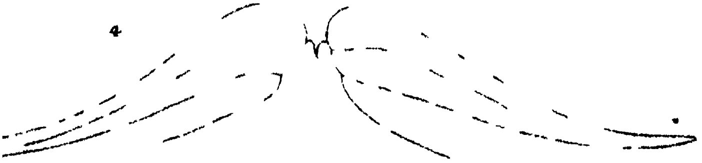

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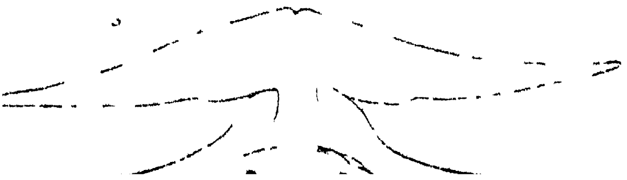

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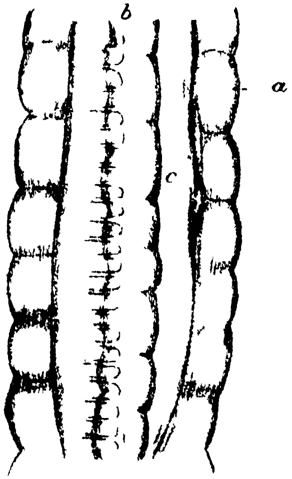

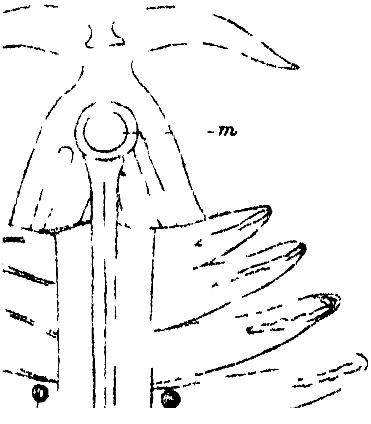

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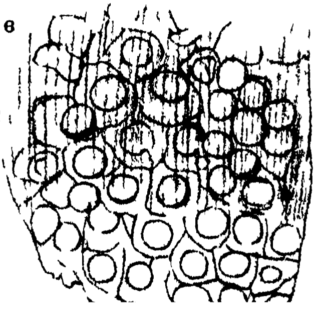

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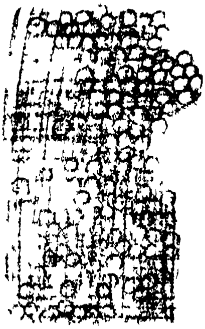

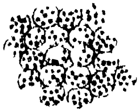

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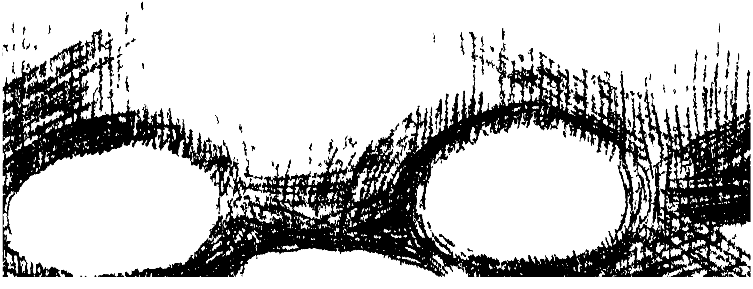

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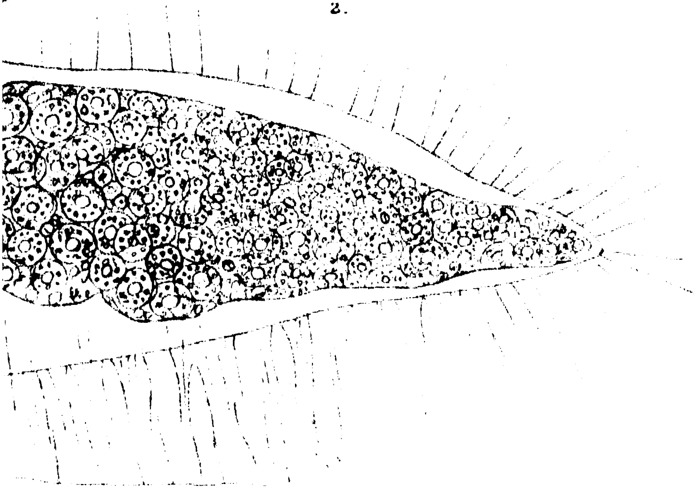

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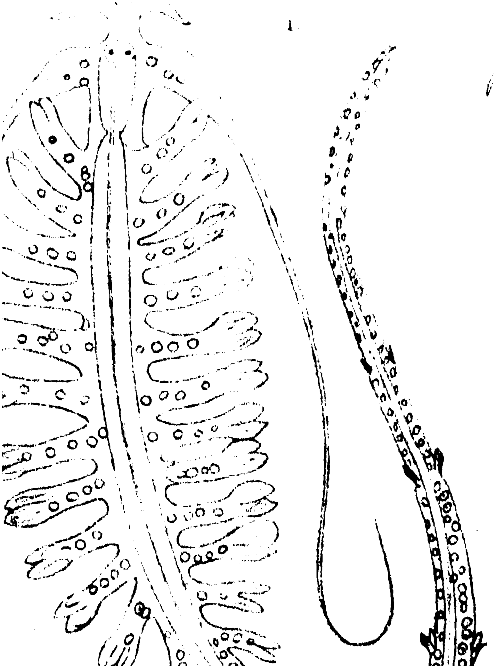

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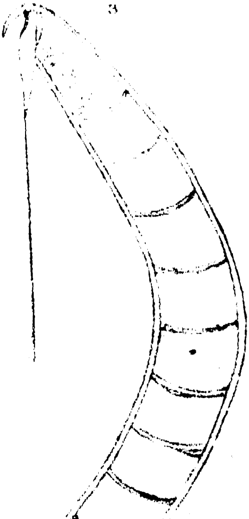

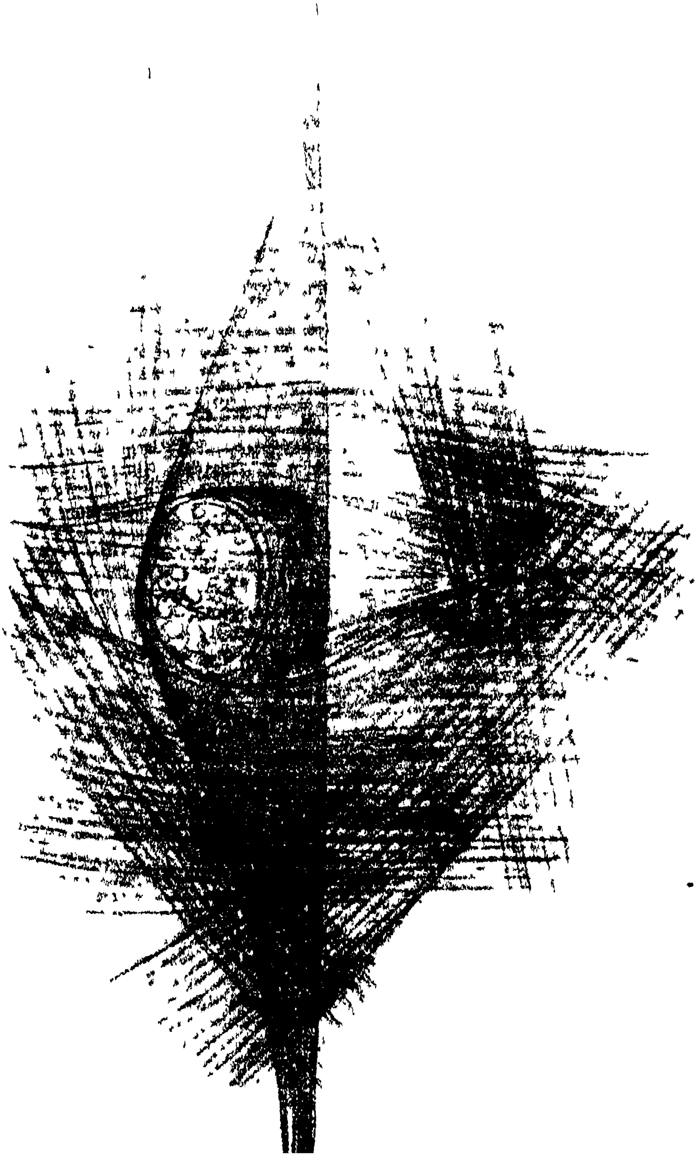

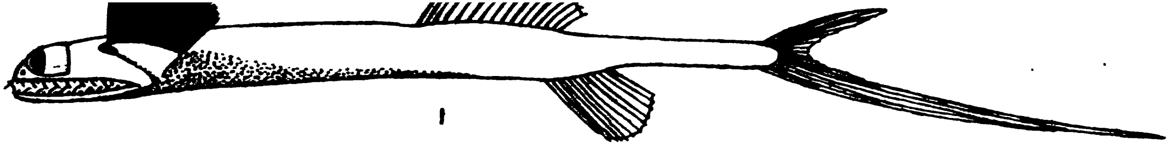

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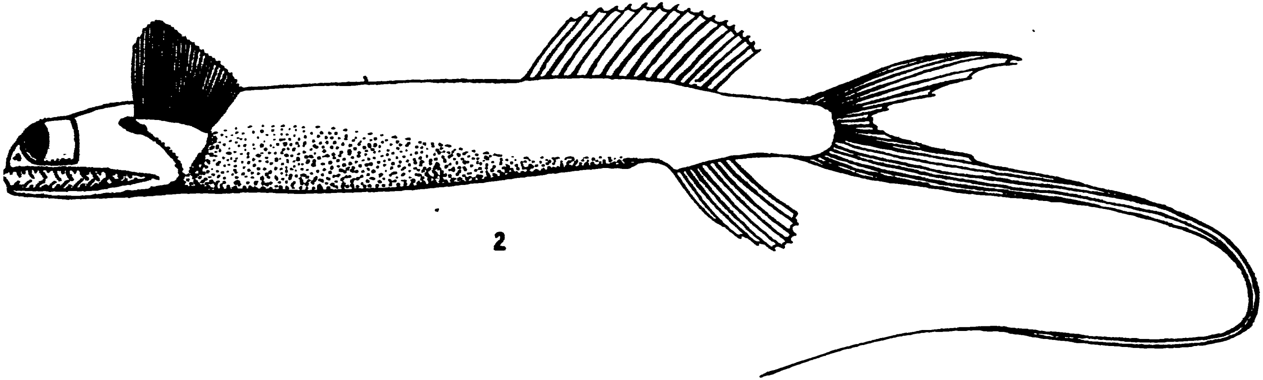

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1. **Gigantura gracilis** (natural size). 2. **Gigantura vorax** (× 1⅓).

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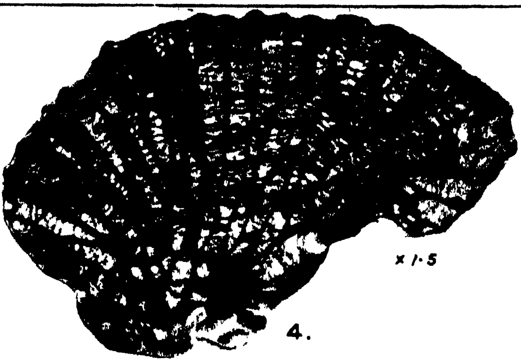
2.

x·25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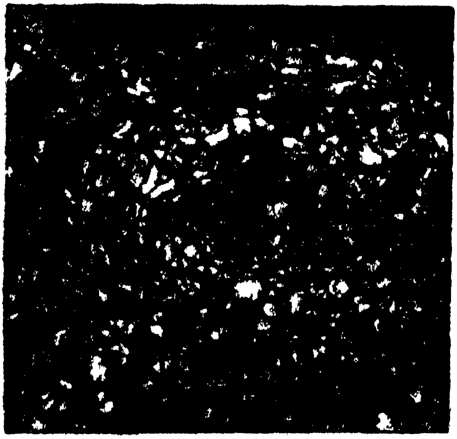
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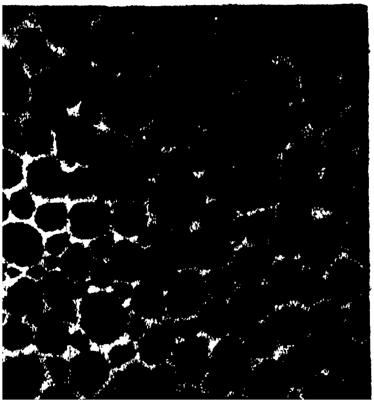

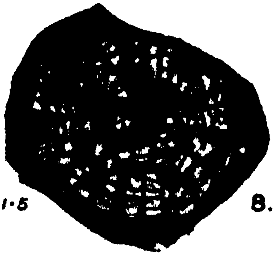
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nat. size

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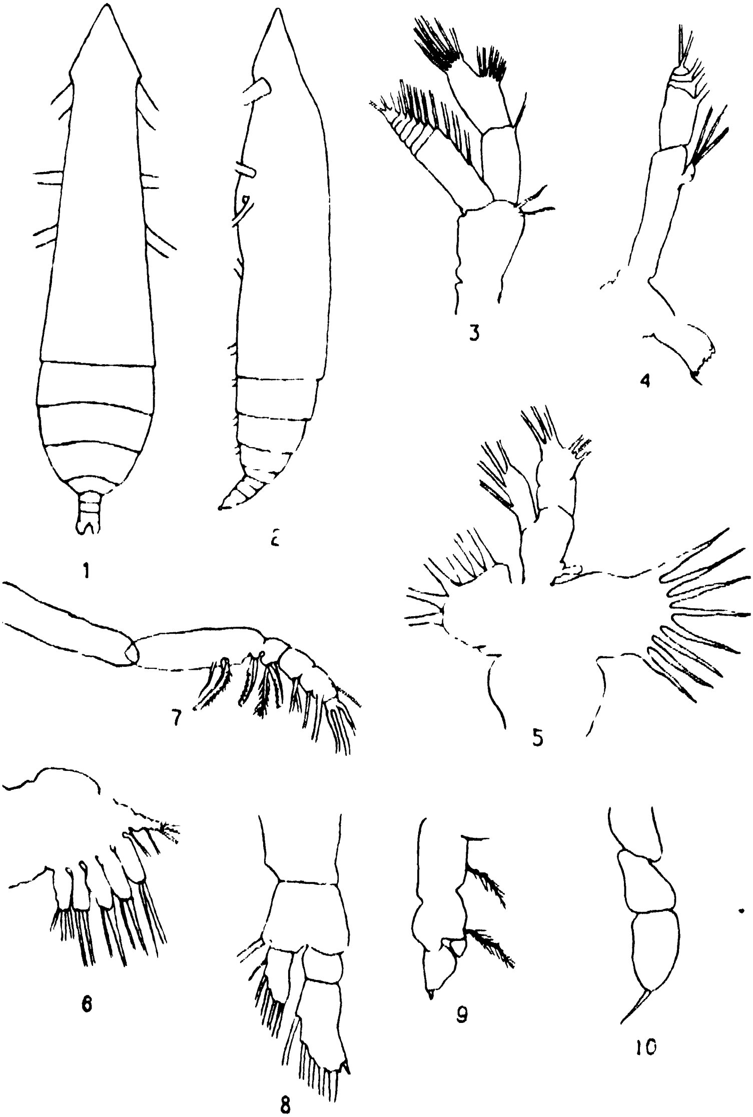

Eucalanus longiceps, sp. n., a new Antarctic Copepod.

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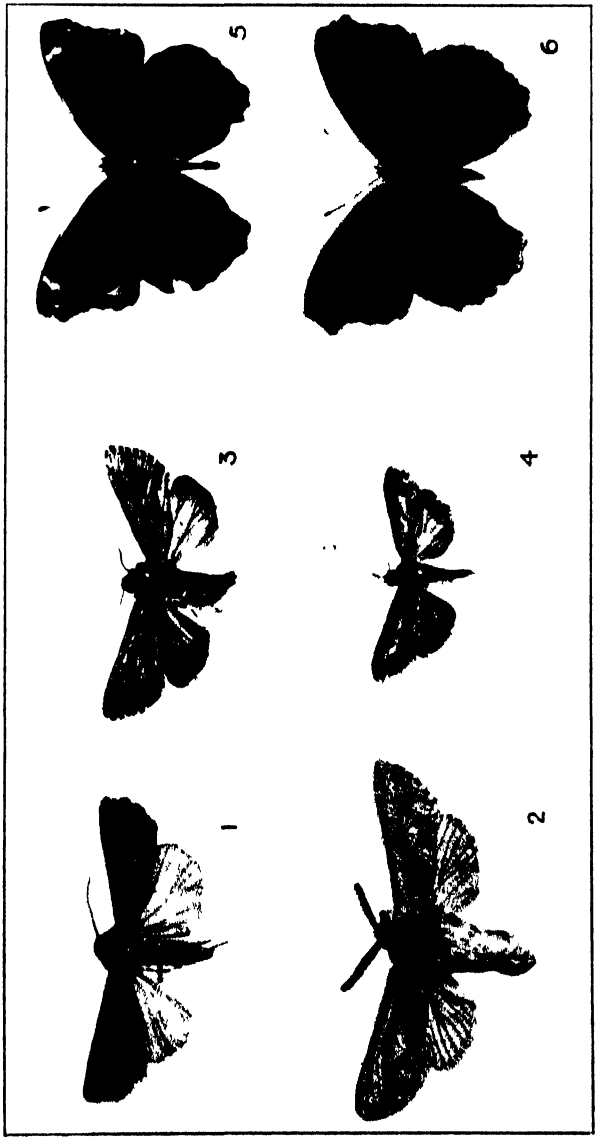

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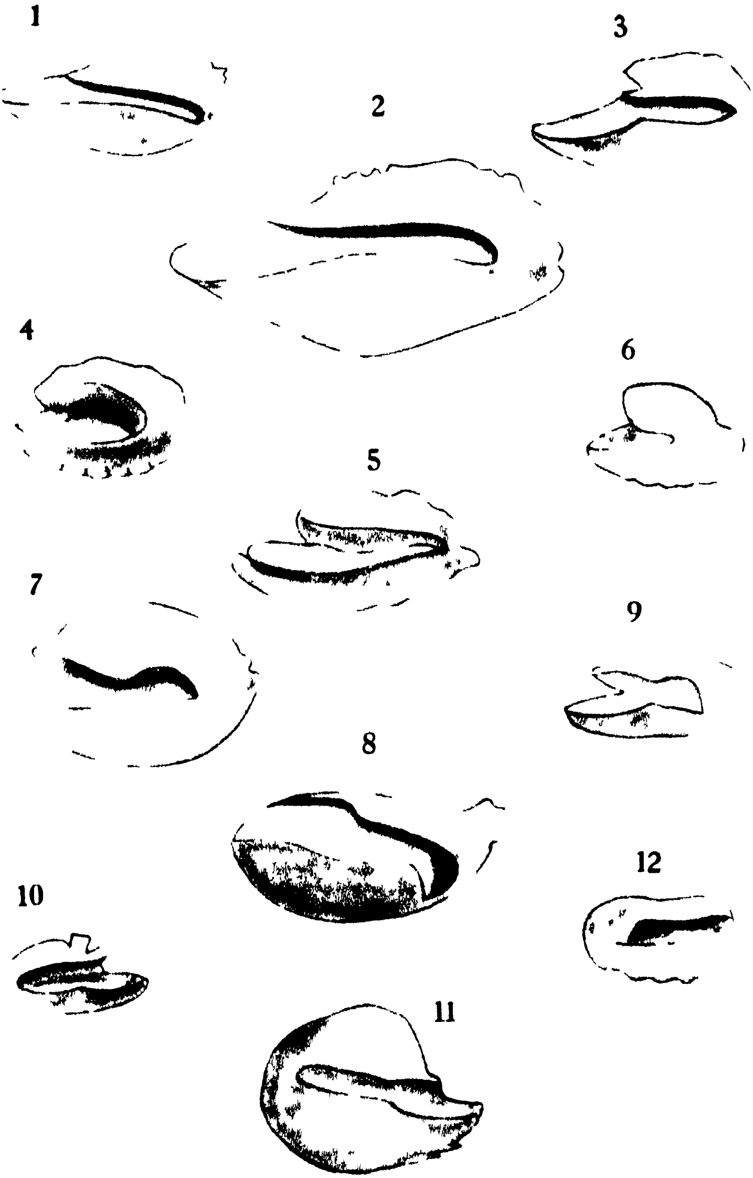

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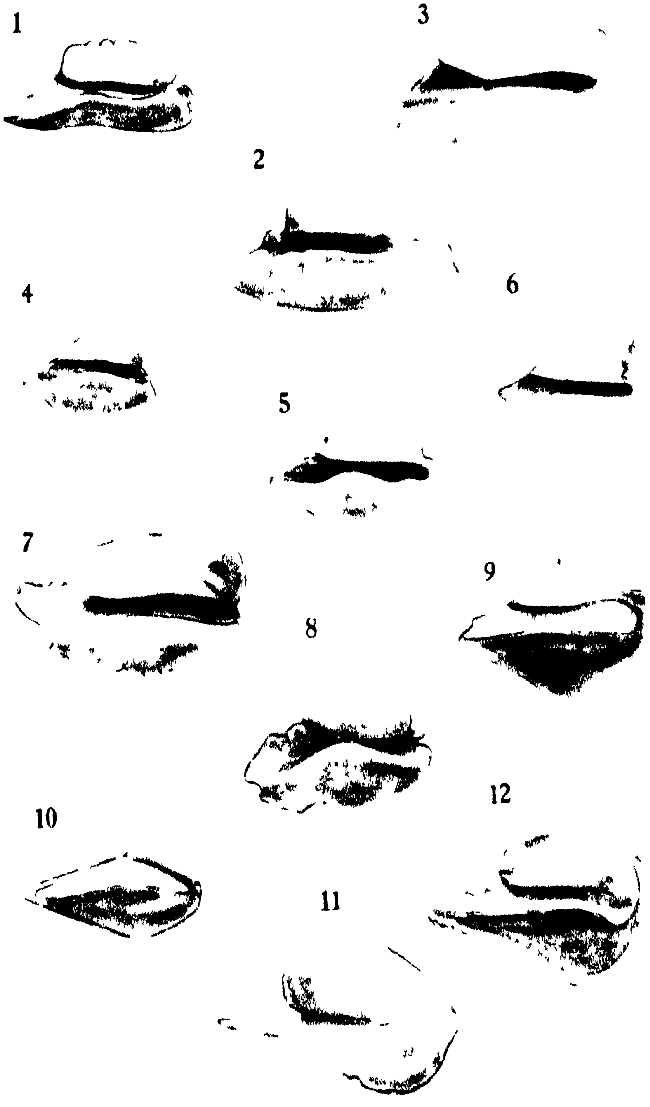
Otoliths of the Neopterygian Fishes



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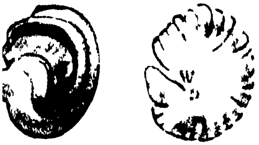

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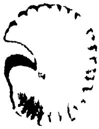

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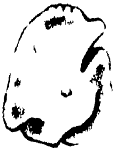

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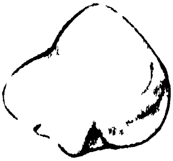

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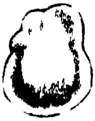

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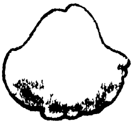

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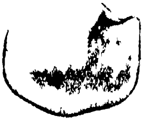

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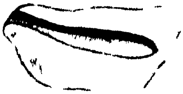

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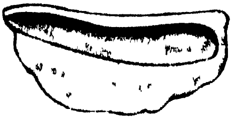

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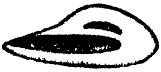

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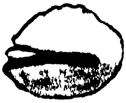

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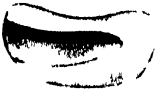

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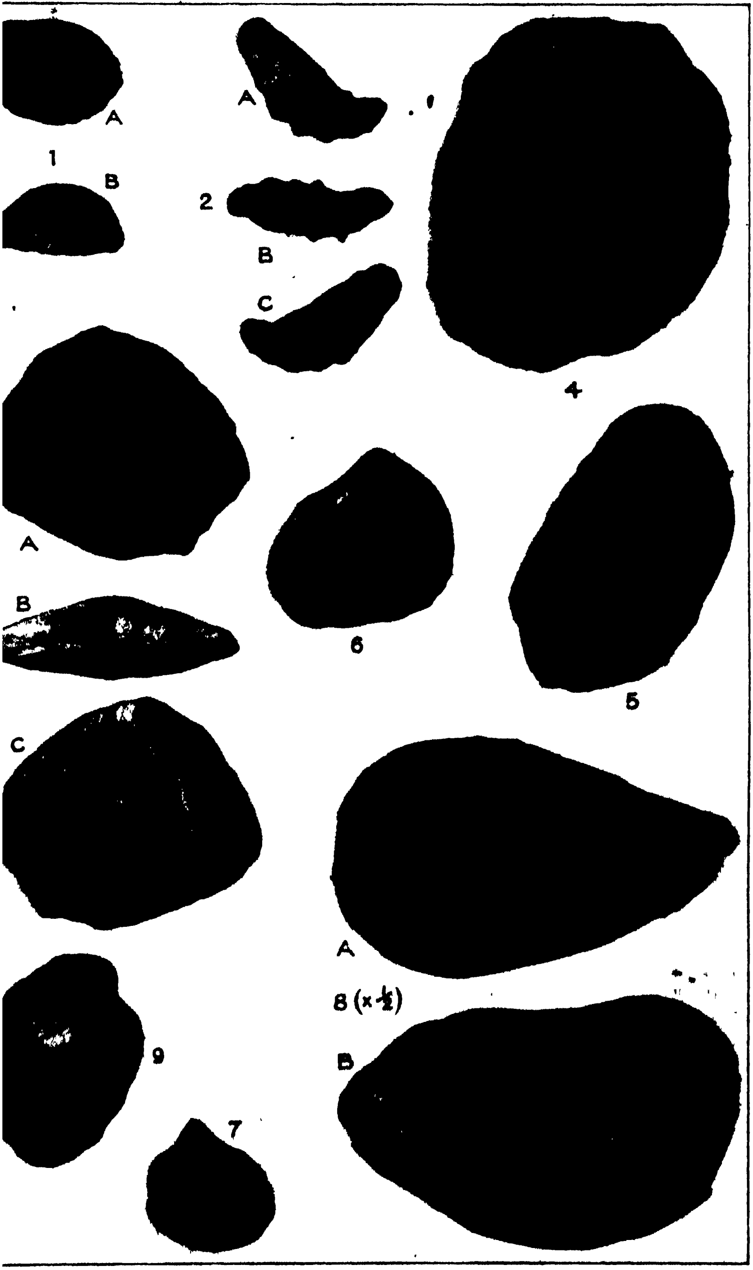
A
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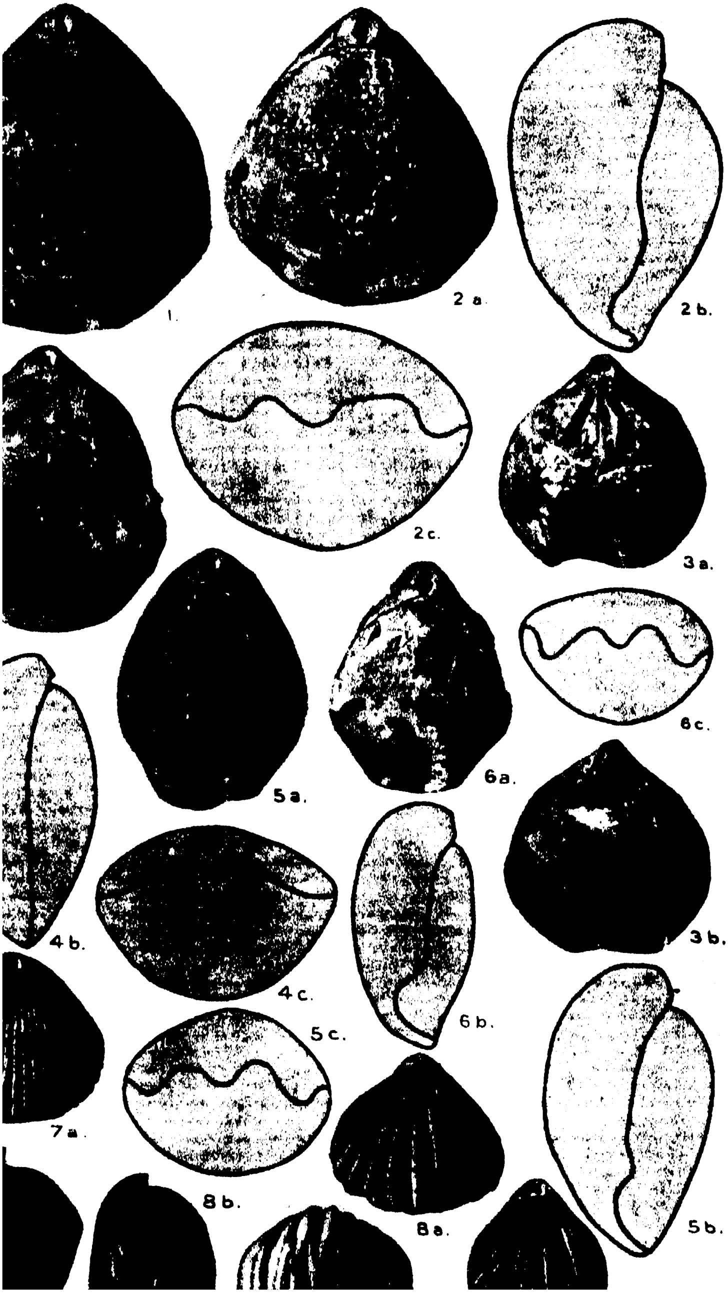
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2 c.
3 a.
6 c.
5 a.
6 a.
4 b.
3 b.
4 c.
6 b.
5 c.
7 a.
8 b.
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5 b.

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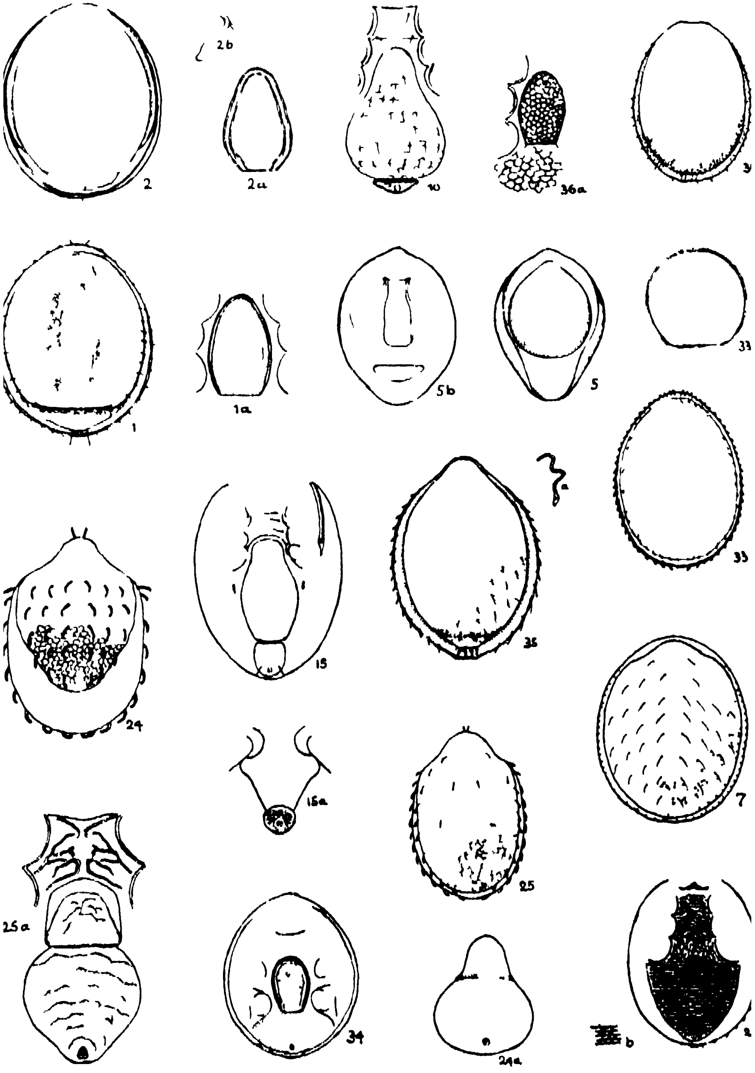
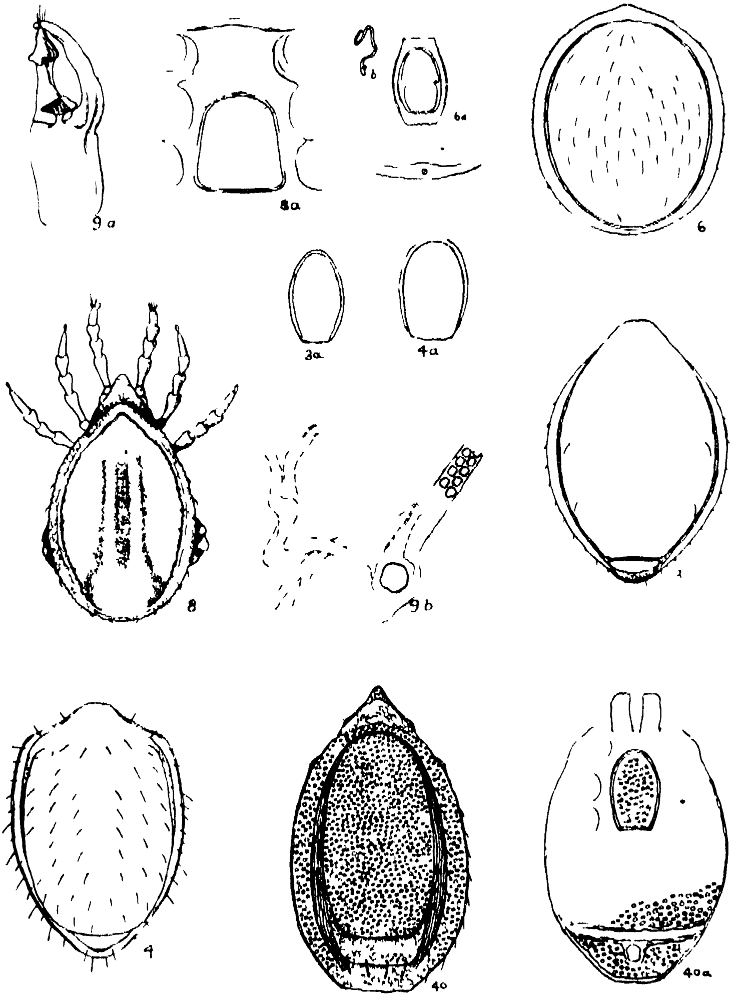
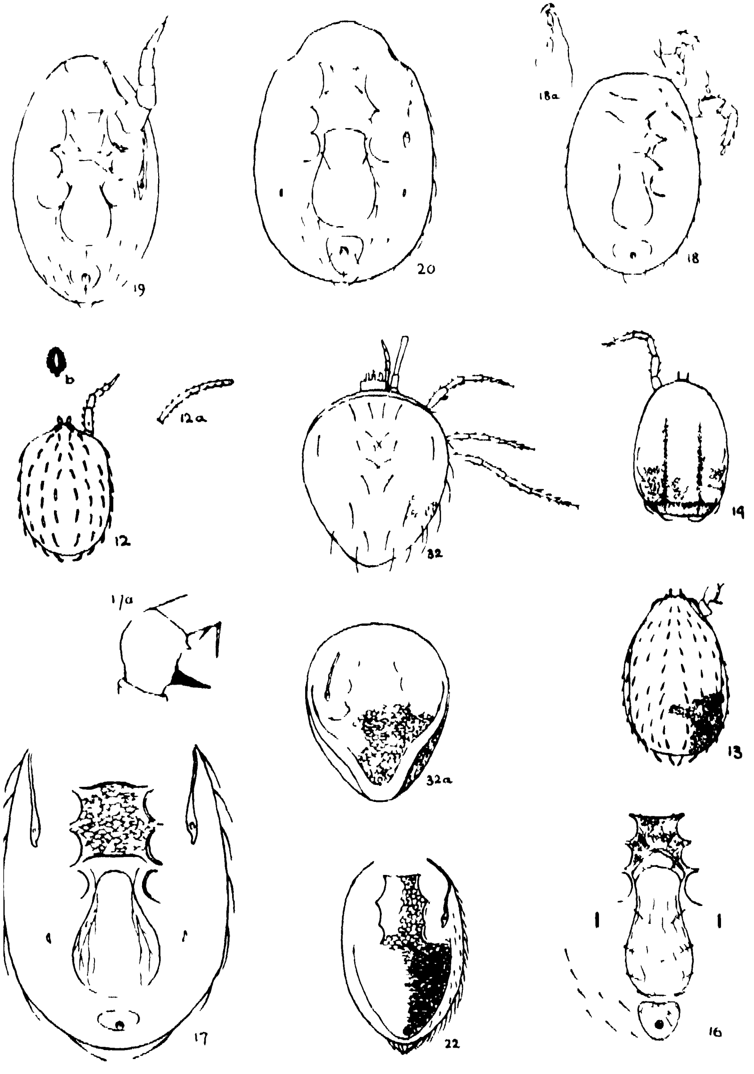


New and rare British Gamasidæ



New and rare British Gamasidæ.



New and rare British Gamasidæ.

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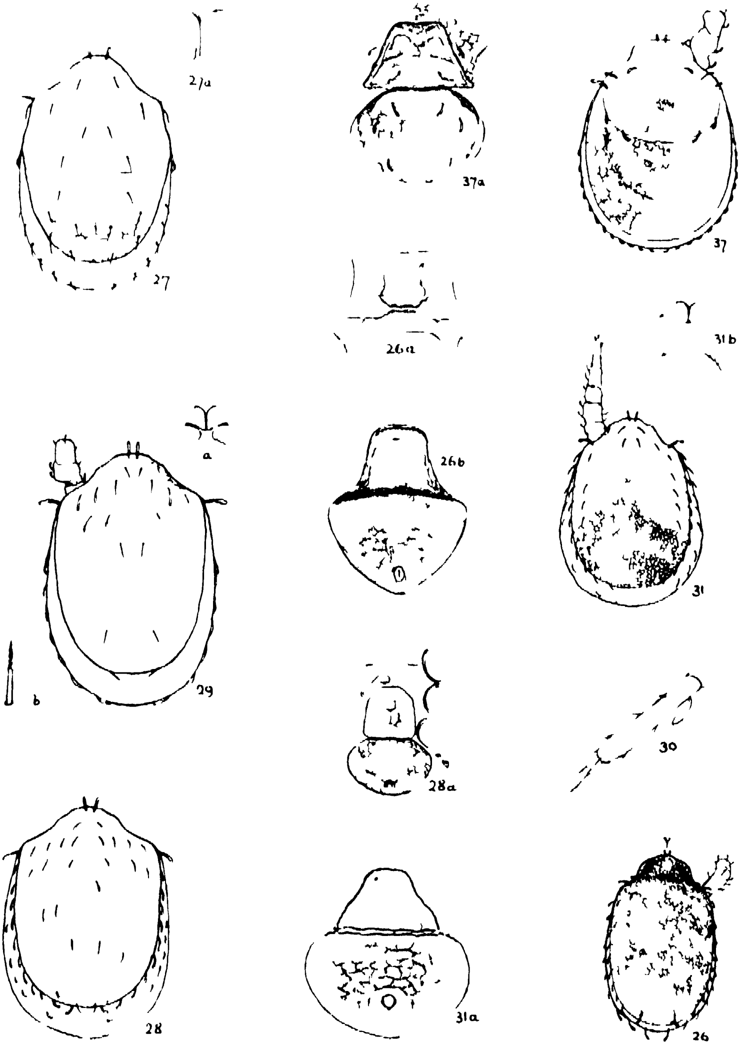

New and rare British Gamasidæ.

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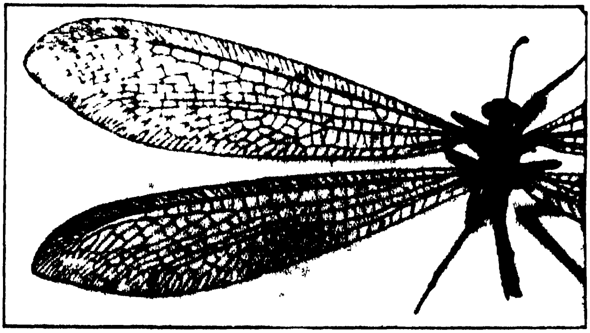
FIG. 1.



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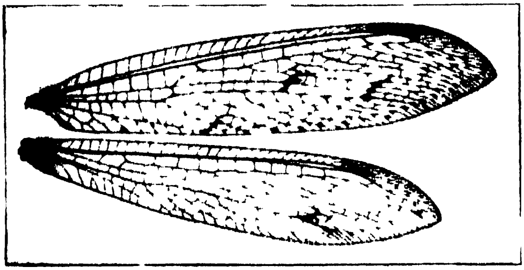

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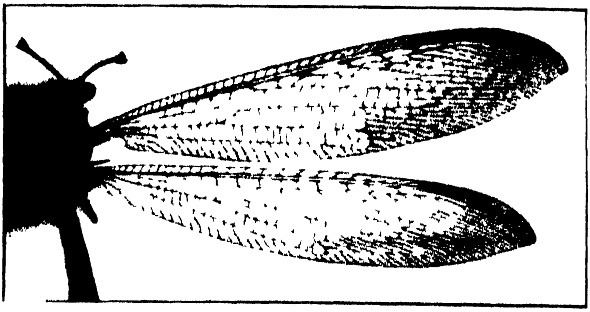
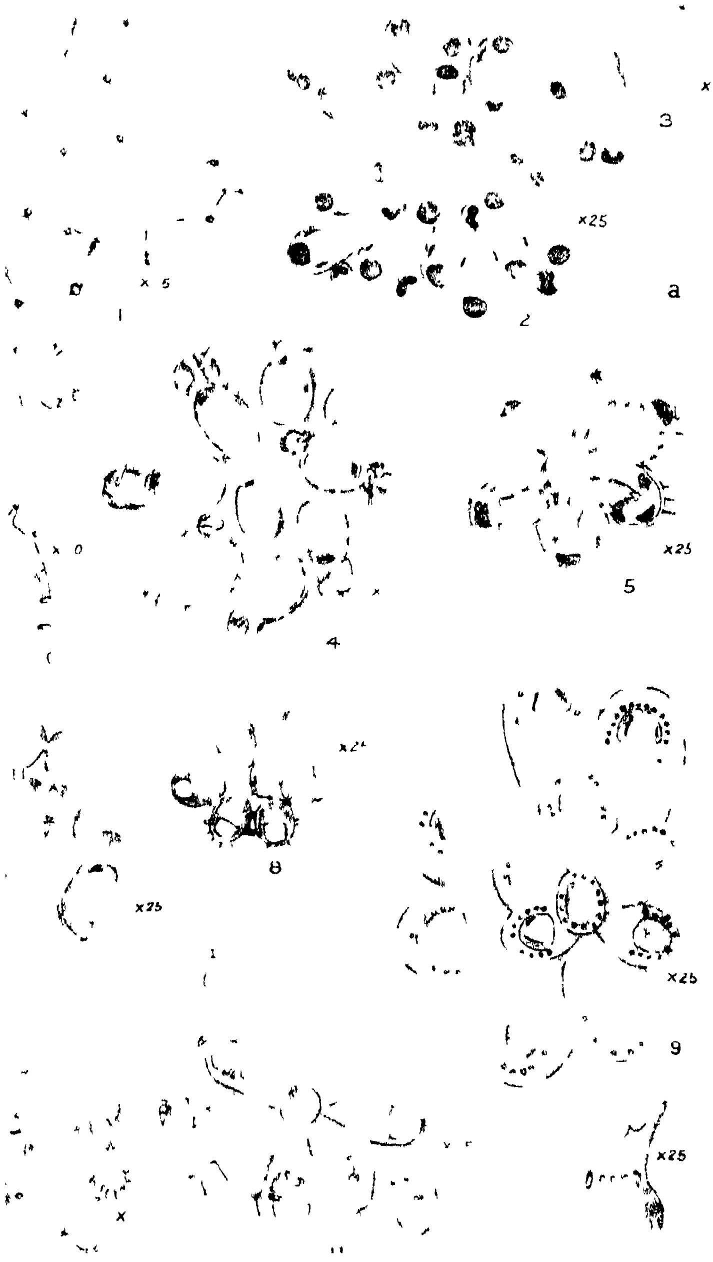


New and little-known Species of Neuroptera.


x50
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x25
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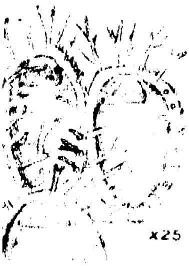

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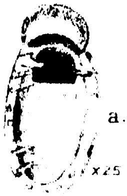

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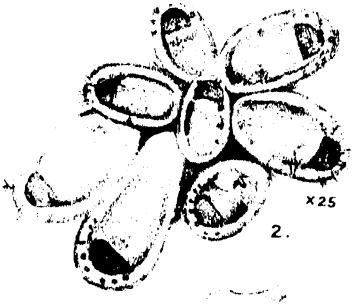

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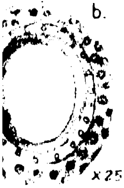

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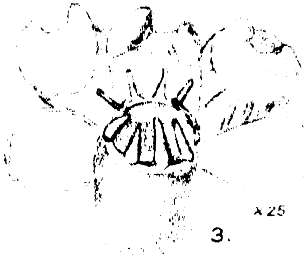

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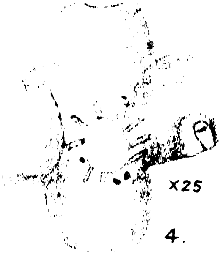

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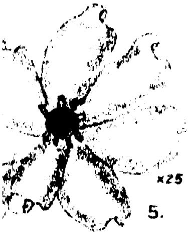

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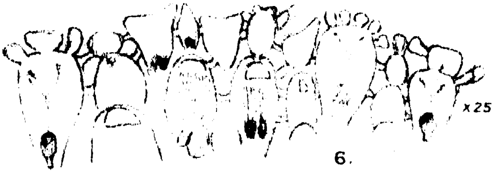

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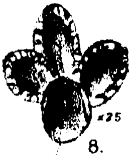

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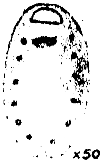

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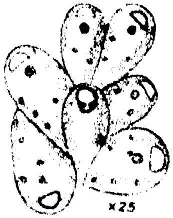

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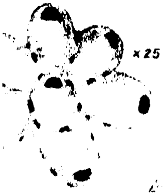

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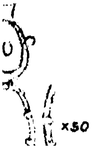

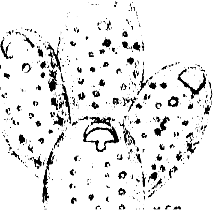

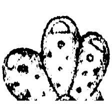

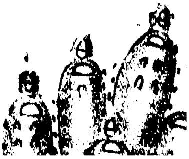

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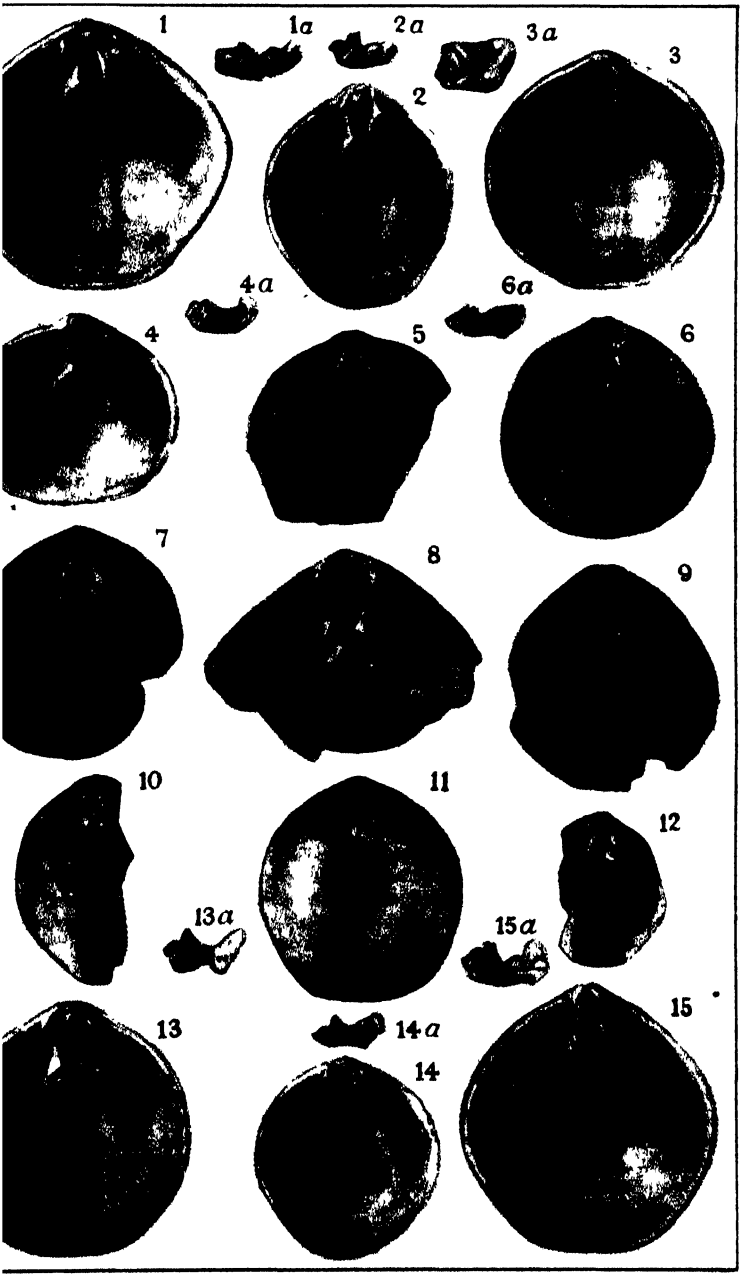

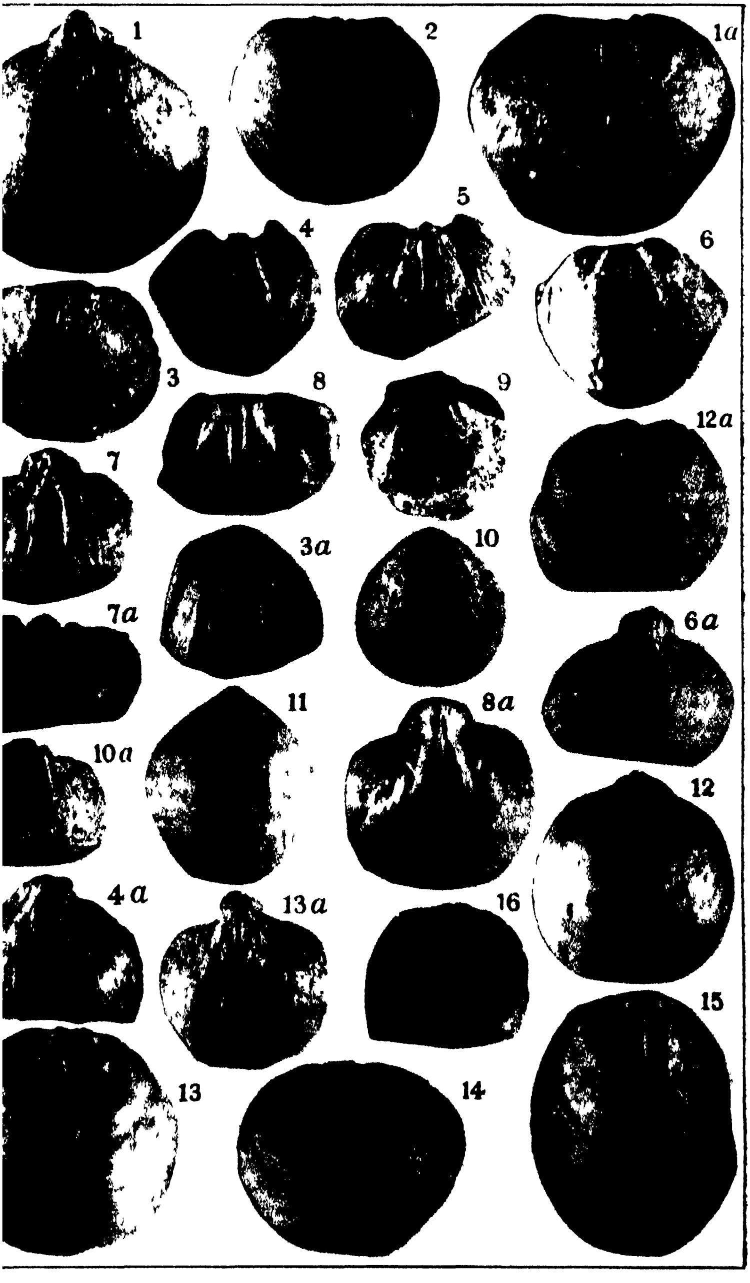
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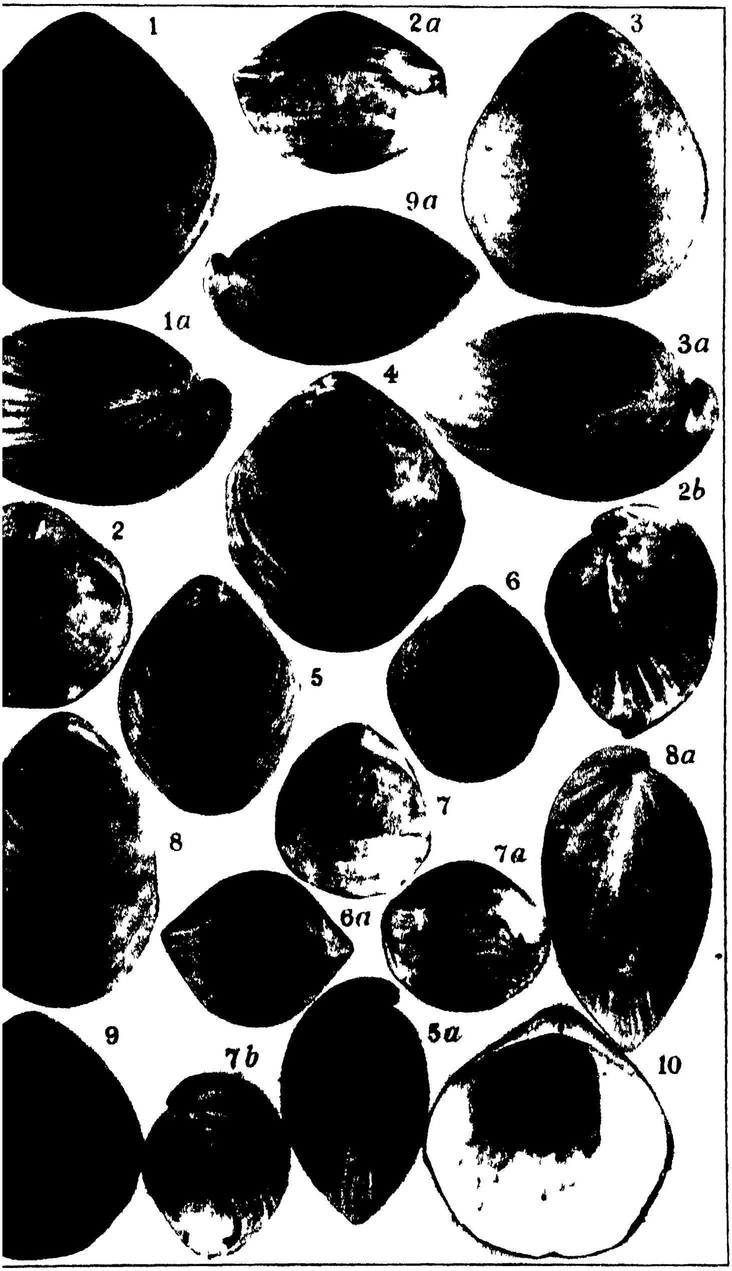
Ann. & Mag. Nat. Hist. S. 9. Vol. XV. Pl. XXV.



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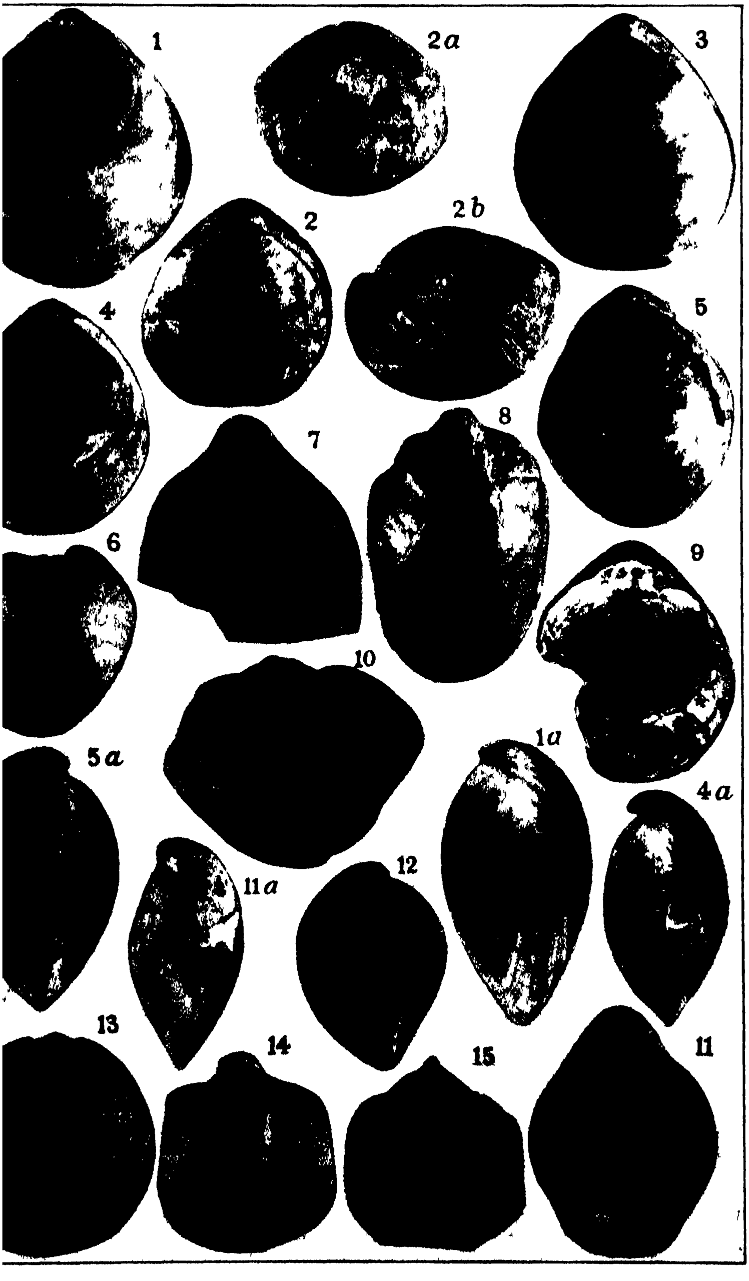
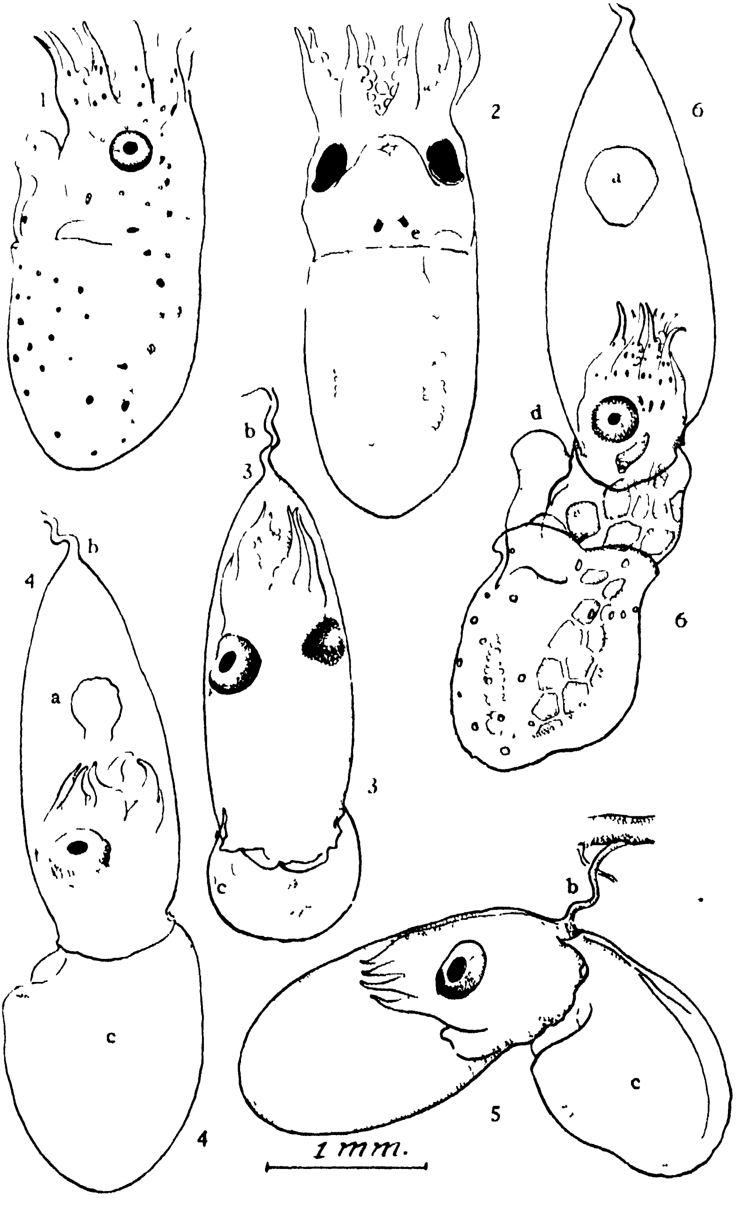
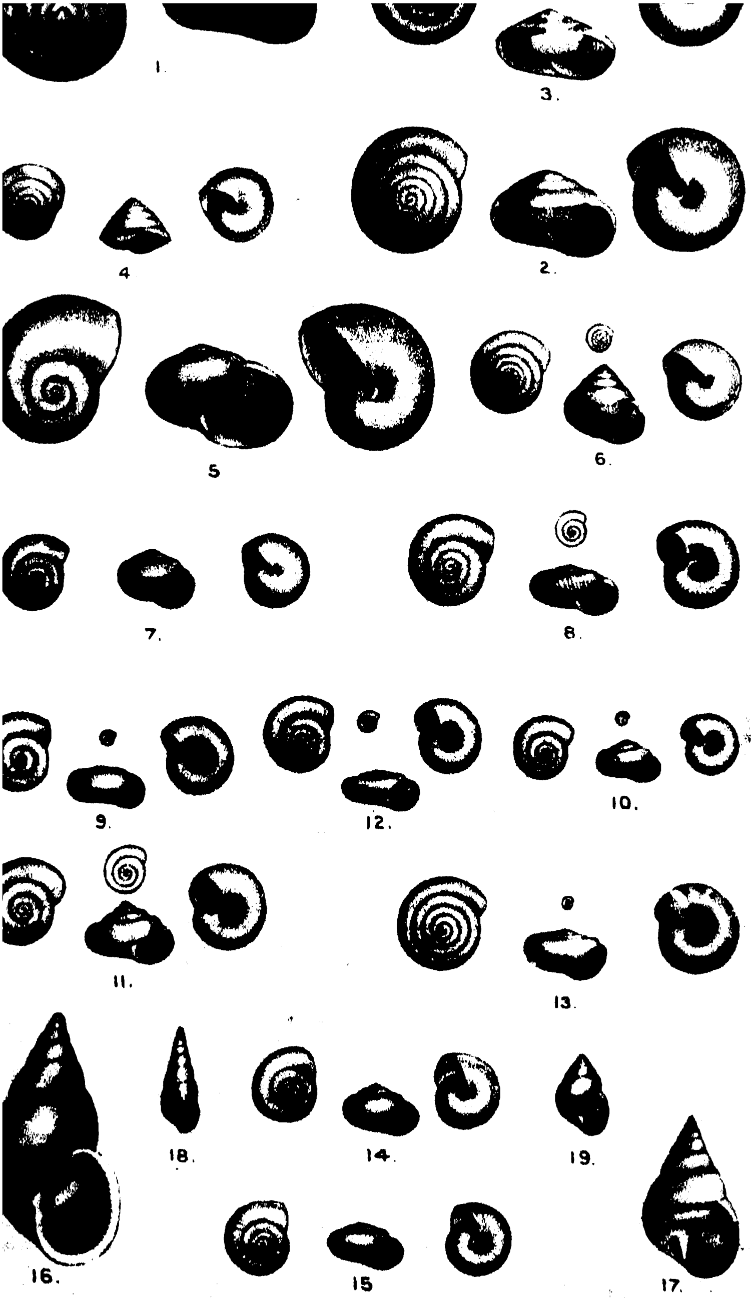




Polypus apollyon, young.



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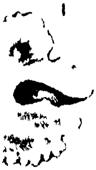

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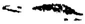

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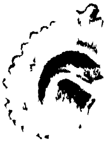

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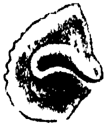

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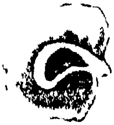

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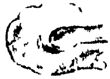

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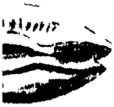

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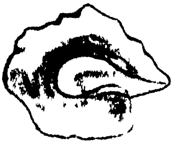

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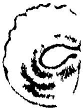

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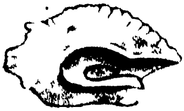

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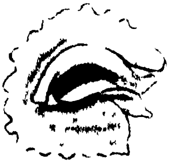

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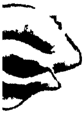

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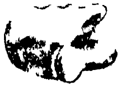

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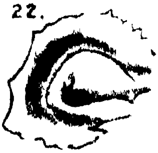

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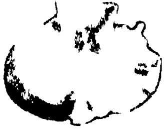

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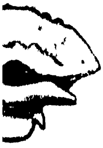

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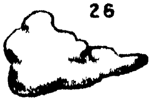

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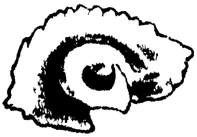

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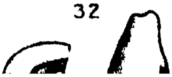

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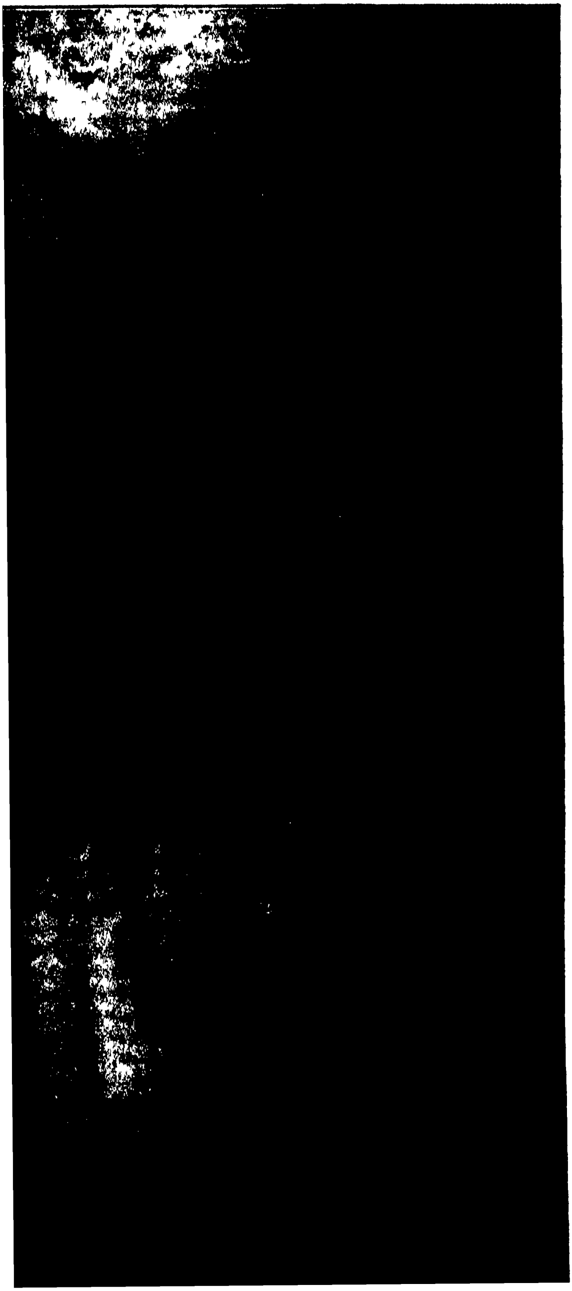

Caturus smithwoodwardi, sp. n.

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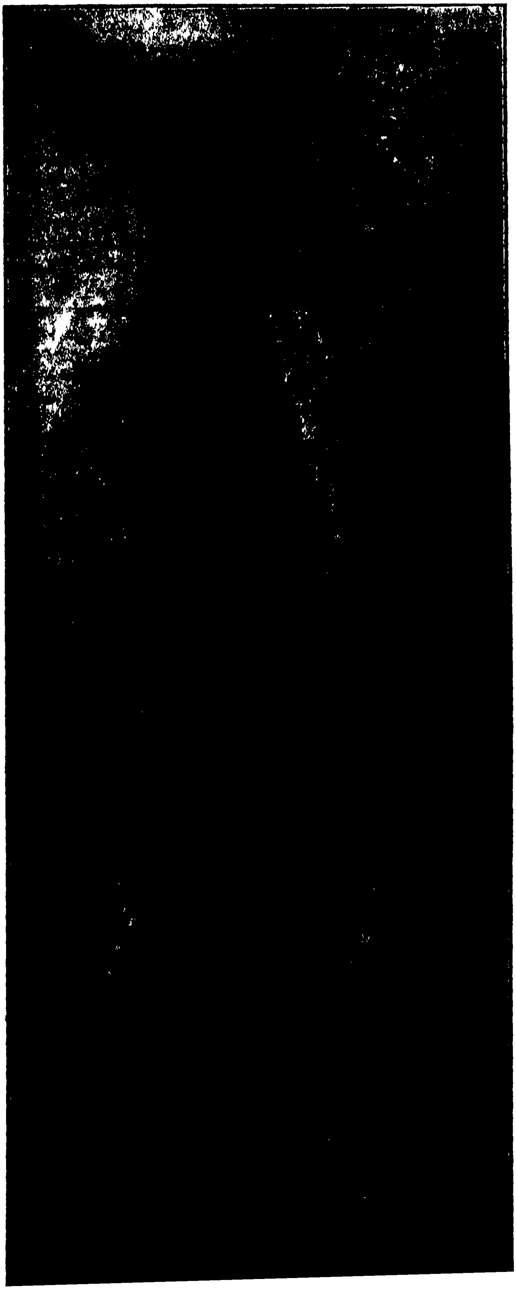
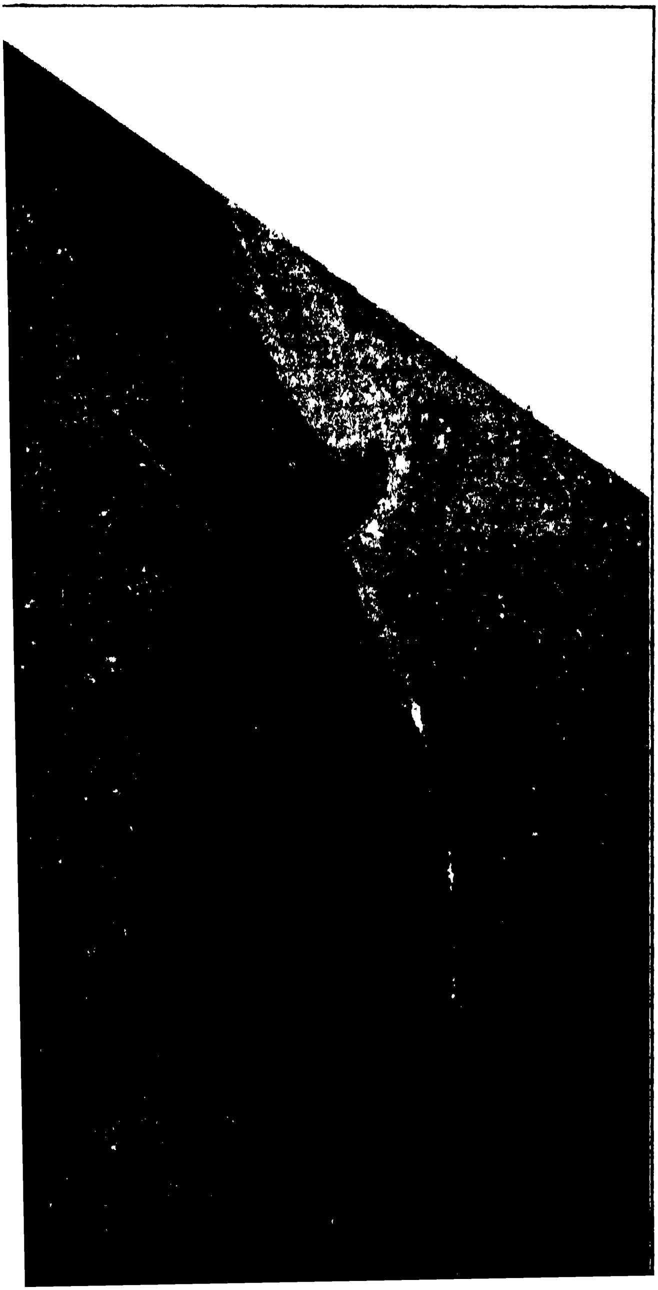


Sauropsis veruinalis, sp n.

Herring photo



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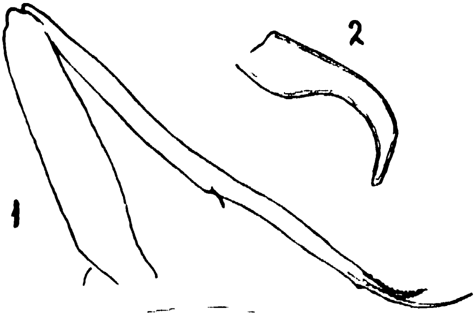
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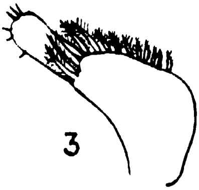
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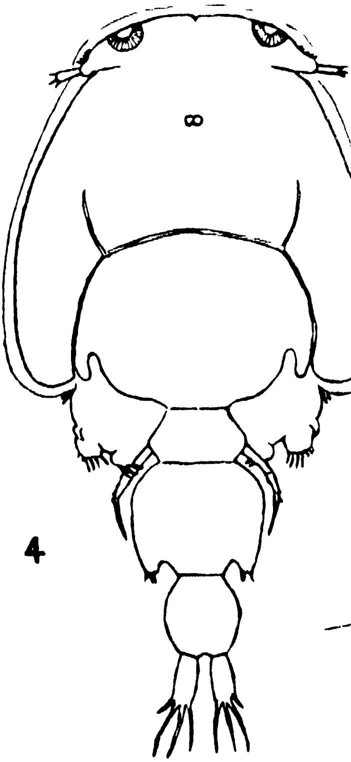
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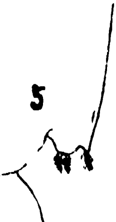
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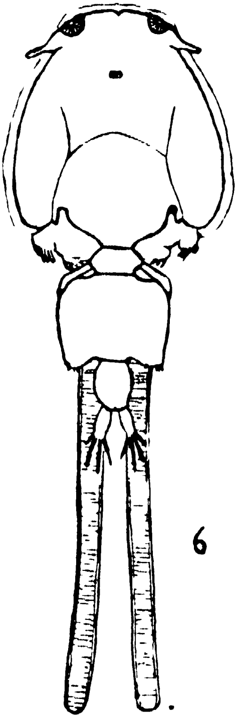
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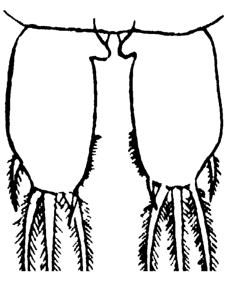

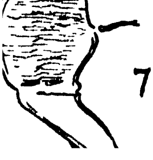
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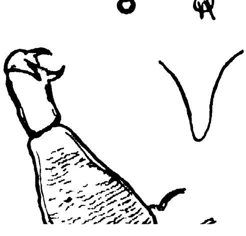
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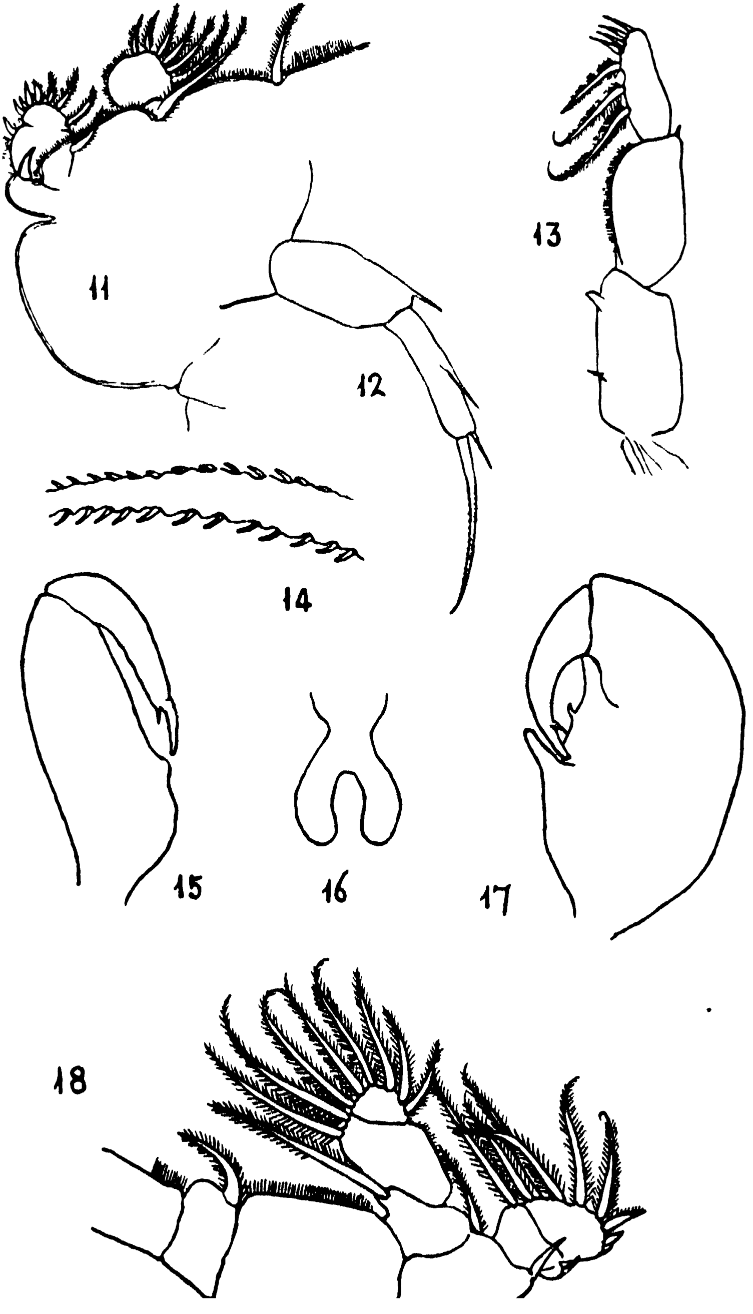

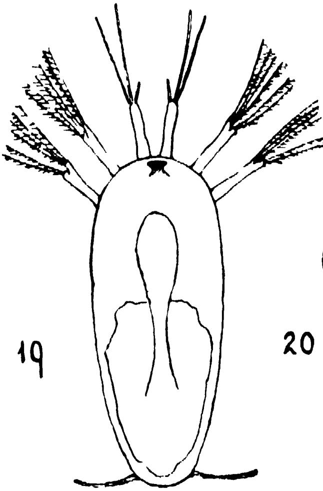
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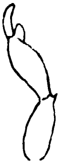
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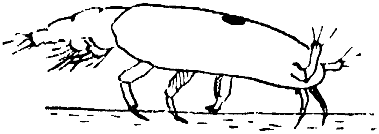
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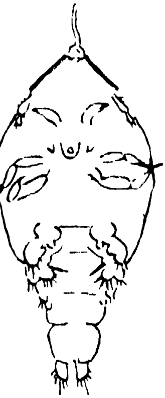
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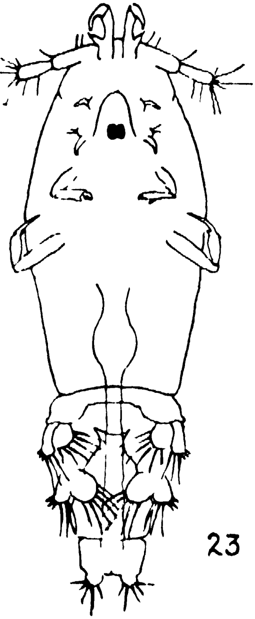
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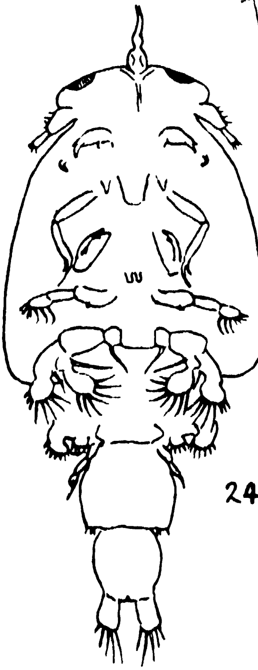
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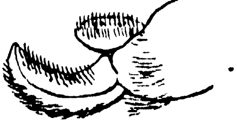
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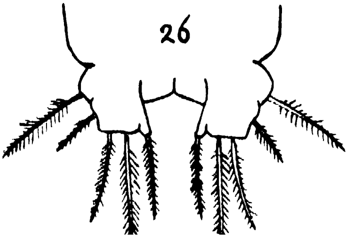
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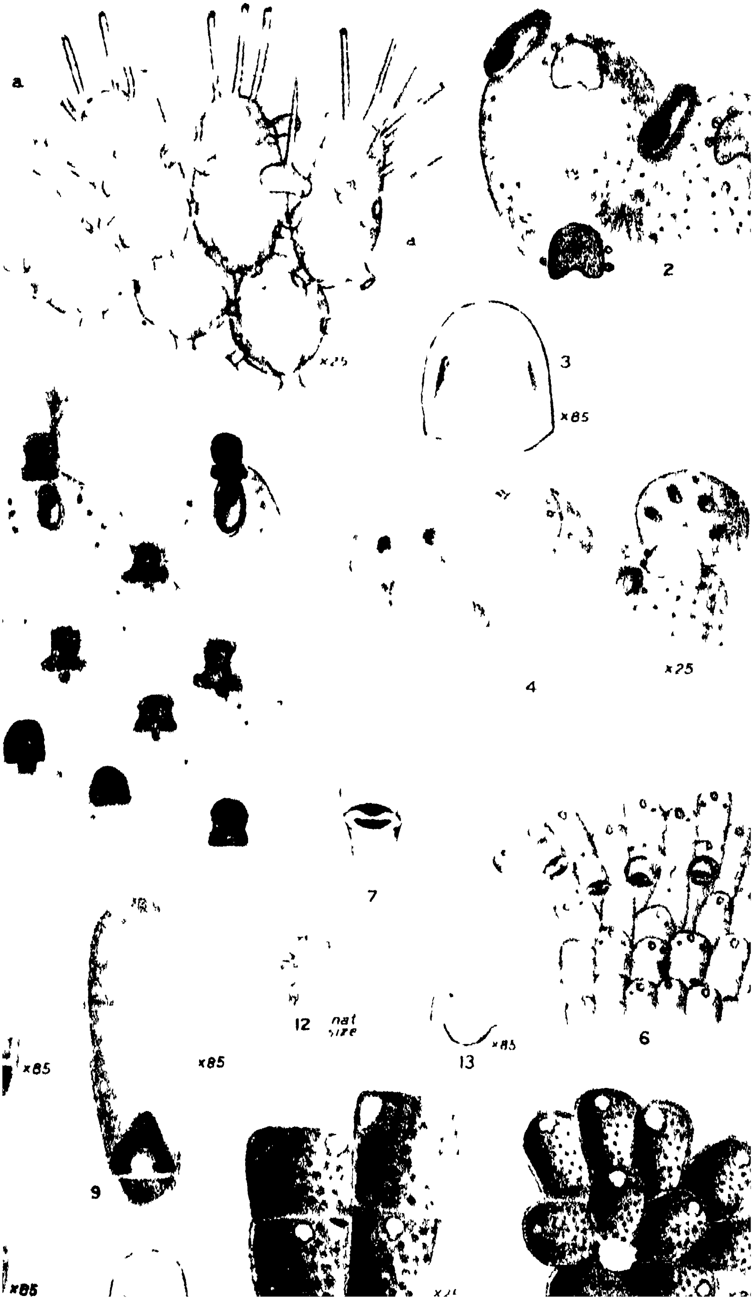
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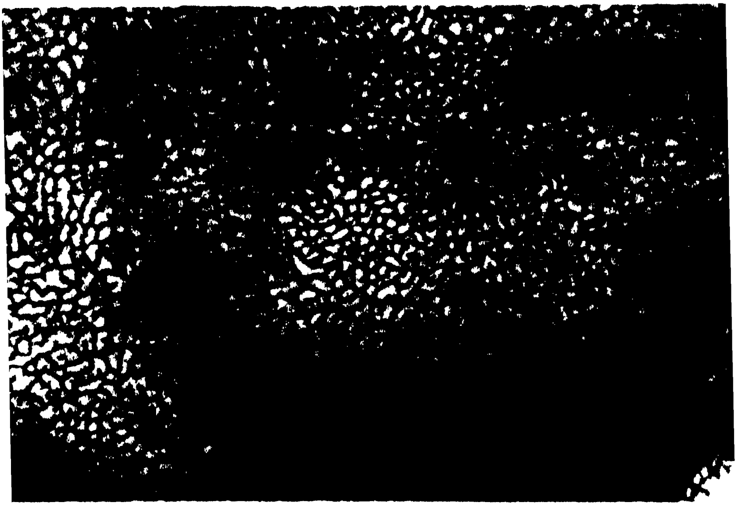

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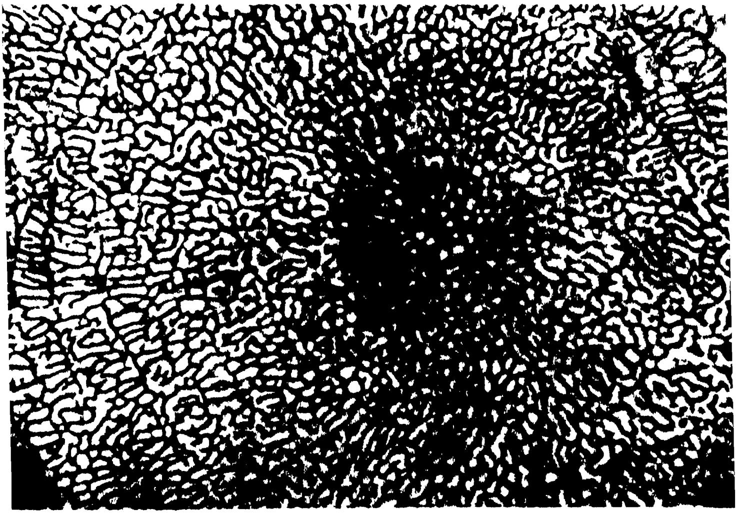

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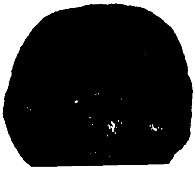

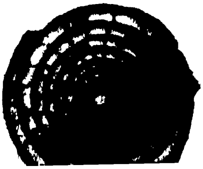

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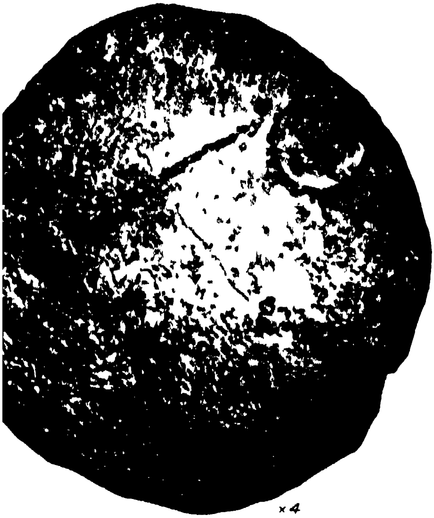
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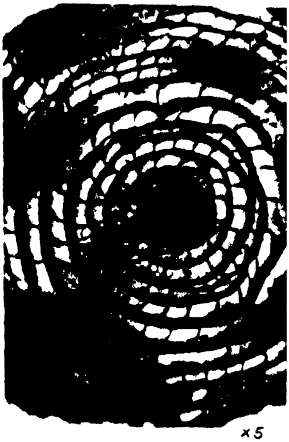
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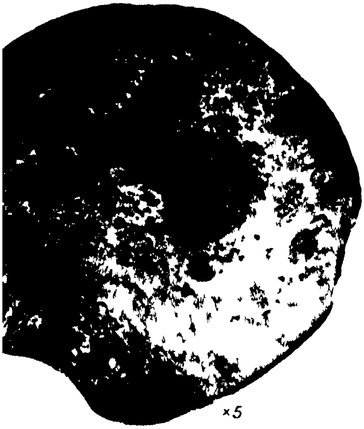
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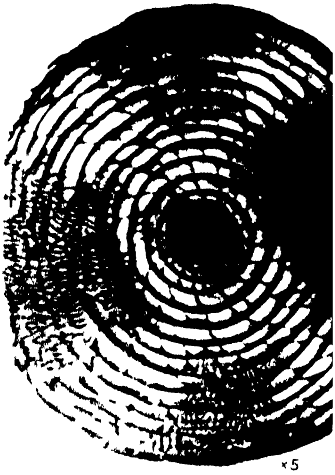
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